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6700B

Sweep Oscillator (mainframe)

INSTRUCTION MANUAL

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MARCONI INSTRUMENTS LIMITED

Sweep Oscillator (mainframe) 6700B

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MARCONI INSTRUMENTS LIMITED
MICROWAVE PRODUCTS DIVISION
(formerly Sanders Division)
STEVENAGE HERTFORDSHIRE ENGLAND
A GEC-MARCONI ELECTRONICS COMPANY

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Note...

Each page bears the date of the original issue or the code number and date of the latest amendment (Am. 1, Am. 2 etc.). New or amended material of technical importance introduced by the latest amendment is indicated by triangles positioned thus ▶.....◀ to show the extent of the change. When a chapter is reissued the triangles to not appear.

Any changes subsequent to the latest amendment state of the manual are included on inserted sheets coded C1, C2 etc.

NOTES AND CAUTIONS

ELECTRICAL SAFETY PRECAUTIONS

This equipment is protected in accordance with IEC Safety Class 1. It has been designed and tested according to IEC Publication 348, 'Safety Requirements for Electronic Measuring Apparatus', and has been supplied in a safe condition. The following precautions must be observed by the user to ensure safe operation and to retain the equipment in a safe condition.

Defects and abnormal stresses

Whenever it is likely that protection has been impaired, for example as a result of damage caused by severe conditions of transport or storage, the equipment shall be made inoperative and be secured against any unintended operation.

Removal of covers

Removal of the covers is likely to expose live parts although reasonable precautions have been taken in the design of the equipment to shield such parts. The equipment shall be disconnected from the supply before carrying out any adjustment, replacement or maintenance and repair during which the equipment shall be opened. If any adjustment, maintenance or repair under voltage is inevitable it shall only be carried out by a skilled person who is aware of the hazard involved.

Note that capacitors inside the equipment may still be charged when the equipment has been disconnected from the supply. Before carrying out any work inside the equipment, capacitors connected to high voltage points should be discharged; to discharge mains filter capacitors, if fitted, short together the L (live) and N (neutral) pins of the mains plug.

Mains plug

The mains plug shall only be inserted in a socket outlet provided with a protective earth contact. The protective action shall not be negated by the use of an extension lead without protective conductor. Any interruption of the protective conductor inside or outside the equipment is likely to make the equipment dangerous.

Fuses

Note that the supply fuse is connected in series with the brown (live) wire of the supply lead. If the equipment is connected to the supply via a two-pin plug, it will be possible for the fuse to become connected to the neutral side depending upon the orientation of the plug in its socket. In these circumstances certain parts of the instrument could remain at supply potential even after the fuse has ruptured.

To provide protection against breakdown of the supply lead, its connectors, and filter where fitted, an external supply fuse (e.g. fitted in the connecting plug) should be used in the live lead. The fuse should have a continuous rating not exceeding 6 A.

Make sure that only fuses with the required rated current and of the specified type are used for replacement. The use of mended fuses and the short-circuiting of fuse holders shall be avoided.

Chapter 1

GENERAL INFORMATION

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SCOPE OF MANUAL

1. This manual contains information necessary for understanding the application and operation of the Marconi Instruments type 6700B Sweep Oscillator (mainframe). The manual provides a general description, installation information, operation instructions, principles of operation and maintenance information. A complete set of circuit diagrams is also provided to aid in understanding the various modes of operation and proper servicing of the equipment.

2. The type 6700B Sweep Oscillator accepts a series of solid-state plug-in r.f. units. Fig. 1 shows the type 6700B with a type 6790A RF Unit installed. Although reference to controls, indicators and connectors located on the r.f. unit are used frequently throughout the following sections, this manual does not contain a detailed discussion of the r.f. unit. Refer to the applicable r.f. unit instruction manual for specifications, operating instructions and maintenance information for a specific r.f. unit.

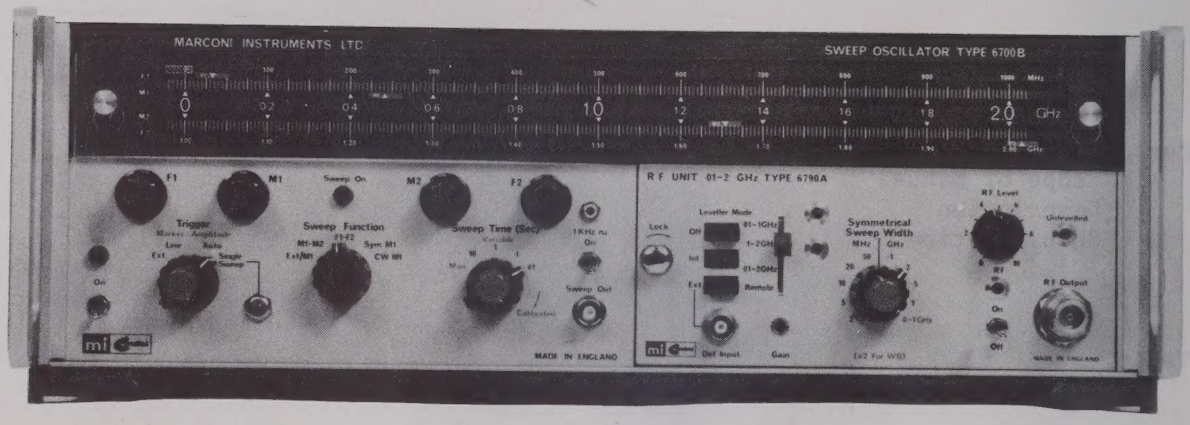

Fig. 1 Sweep Oscillator type 6700B with RF Unit type 6790A installed

DESCRIPTION

3. The Marconi Instruments type 6700B is a solid-state, high performance microwave sweep oscillator featuring plug-in versatility and multi-band operation capability over a sweepable range of 10 MHz to 18 GHz. A plug-in r.f. unit is an integral part of the sweep oscillator circuitry and must be installed in the front panel compartment of the type 6700B. Available r.f. units covering eight frequency ranges are shown in Table 1. All basic r.f. units are designed for external levelling. Optional r.f. units with internal levelling are also available.

TABLE 1 RF PLUG-IN UNITS

Marconi Instruments type	*Frequency Range (GHz)*
6790A	0.01 - 2.0
6730A	1 to 2
6738A	1.7 - 4.3
6742A	2 to 4
6754A	4 to 8
6766A	8 to 12.4
6770A	10 to 15
6774A	12.4 to 18

4. With an r.f. unit installed, the type 6700B becomes a versatile electronically tunable sweep source of precision r.f. signals suitable for testing and calibration of r.f. components and systems. This high performance sweep oscillator provides stable coverage down to 10 MHz, with exceptionally low spurious and harmonic content, and provides continuous coverage up to 18 GHz. It provides four sweep modes: automatic, external, single and manual. The automatic, external and single sweep modes are adjustable in sweep time from 0.01 to 100 s/sweep. Other performance features include superior frequency accuracy, high f.m. rates for phase lock applications, and symmetrical sweep widths of from 0 to 100% of the frequency bands.

5. The all solid-state design of the type 6700B, including the oscillators, makes it a light weight unit that provides convenient portability for field operations. Since each r.f. unit covers a specific frequency range, a separate high resolution, 350 mm frequency scale is provided with each unit. These scales are keyed to the mainframe to ensure accurate positioning.

SPECIFICATION

6. The following specification applies to the type 6700B with any r.f. unit installed.

7.	Frequency range :	Determined by r.f. unit installed.
8.	Sweep functions	
	Sweep end limits :	Any two frequencies in band set by F1 and F2 controls. Sweeps in either direction from F1 to F2.
	Marker end limits :	Any two frequencies in entire band set by M1 and M2 controls.
	Symmetrical sweep :	Centre frequency set by either M1 control or an external 10 kΩ potentiometer. Sweep width adjustable from 0 to 100% of entire band with continuous, uncalibrated control, or in nine discrete widths calibrated directly in MHz or GHz, from about 0.25% to 100% of band. Width accuracy is ±3% of sweep width for YIG-tuned units; ±10% for varactor-tuned units.
	External :	Direct coupled 10 V for full sweep: positive voltage increases output frequency. Response time: down to 1 ms for full sweep. Provision for external resistance programming. Input impedance 5 kΩ.
	CW operation	Continuously variable single frequency controlled by position of M1 marker. Externally controllable with either 1 kΩ potentiometer or an analogue voltage between 0 and +10 V.

9. Markers : Two independent, adjustable calibrated markers displayed either as dips in r.f. output or externally as video markers. Constant proportion width marker selectable for sharp, bright marking in narrow-width symmetrical displays.

Accuracy : Same as r.f. unit frequency accuracy.

Resolution : Better than 0.05% of r.f. unit bandwidth.

Amplitude : Continuously variable.

Output : Auxiliary video marker: amplitude -5 V. Output impedance 5 kΩ.

10. Triggered sweep modes

External : -10 V input initiates sweep.

Automatic : Sweeps recurs automatically.

Line : Line frequency triggers sweep.

Single sweep : Front panel momentary switch starts sweep.

11. Sweep rates

Automatic : Four decade ranges continuously adjustable from 0.01 s/sweep to 100 s/sweep. Vernier has 10 to 1 range.

Manual : Three-quarter-turn control for sweep between limits set in either end-limit or symmetrical sweep modes.

Sweep dwell time : Delay at start to allow r.f. power level to stabilize. Also delay at end of sweep. Pre-sweep dwell may be switched to Long (for compatibility with network analysers), or Short for other applications.

12. Sweep output : Direct-coupled, constant amplitude sawtooth adjustable from +2 V to +10 V peak, concurrent with swept r.f. output.

13. Proportional output

Switch selectable :

a. Direct-coupled voltage proportional to instantaneous frequency. 0 V at low end and 10 V at high end of band.

b. Direct-coupled voltage proportional to instantaneous frequency. 0 V at low end and 40 V/octave at high end of band.

14. Blanking

Operation :	RF automatically attenuated during retrace to provide base line except when disabled with rear panel switch.
Z-blanking output (rear panel) :	Direct-coupled -5 V pulse: impedance 2.2 kΩ, covering the entire period between end of sweep and commencement of next sweep.

15. Pen lift output : Relay contact closure during forward-trace portion of sweep.

16. RF output

Levelling :	With internal levelling, power variation is as indicated for r.f. unit. With an external directional coupler and detector, power variation is maintained to within ±0.1 dB, plus coupler and detector variation. Provision for power meter levelling from + or - meter output. Levelling input impedance is 1 kΩ.
Amplitude :	RF level controlled from front panel or with external 10 kΩ potentiometer or an analogue input voltage at rear panel.
RF level ON/OFF :	Front panel switch permits complete r.f. cut off. Rear panel binary input permits remote control.

17. Modulation

Amplitude modulation :	*Internal*: Square wave adjustable from 950 to 1050 Hz with rise time of 10 µs maximum. On/off ratio greater than 40 dB. *External*: +10 V signal increases r.f. output to rated level (with r.f. level control set at minimum). Rise and fall time 1 µs unlevelled and 2 µs levelled. Input impedance 10 kΩ.
Frequency modulation :	Direct-coupled wide-band f.m. input with maximum deviation rate determined by r.f. unit.

18. Spurious signals : 60 dB below rated r.f. output, except 2nd harmonic which is 20 dB to 8 GHz and 30 dB from 8 to 18 GHz.

19. General

Dimensions :	145 mm high x 426 mm wide x 390 mm deep.
Weight (mainframe only) :	10 kg nett.

	Power input :	115/230 V ±10%, 48-62 Hz, approximately 100 VA.
20.	Option-01 :	Digital remote frequency programming.
	Frequency resolution :	1000 points (12-line, 3 digit b.c.d. input).
	Memory storage :	Any one digital word (frequency) on 12-line input.
	RF enable :	1-line binary for on/off control (standard feature).
	Logic :	+5 V logic remote contact closure.

Chapter 2

INSTALLATION

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2 Power considerations
4 Operating temperature range
5 Rack/bench conversion
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UNPACKING

1. The Marconi Instruments type 6700B Sweep Oscillator is shipped in a specially designed carton with shock-absorbing packing material between the instrument and the carton. Use normal care when unpacking the instrument and removing the packing material. Do not destroy the carton or packing material until the equipment is thoroughly inspected. If damage is found, notify the carrier immediately and do not destroy any packing material until an agent of the carrier has examined it.

POWER CONSIDERATIONS

Power source

2. The type 6700B may be operated from an a.c. source of 115 or 230 V (±10%), at 48 to 62 Hz. With the instrument power cord disconnected, move the AC INPUT SELECTOR switch (located on the rear panel), having first removed the transparent locking plate, to the desired voltage range. Replace the transparent locking plate, appropriately oriented. Fuse F1 located on the rear panel must be 3.15 A for 115 V operation or 1.6 A for 230 V operation. Fuses should be "anti-surge" types.

Power cord

3. The type 6700B is supplied with a detachable, three-conductor power cord. This power cord, when plugged into an appropriate receptacle, grounds the instrument cabinet.

OPERATING TEMPERATURE RANGE

4. The type 6700B is designed to operate within its specifications when the ambinet temperature is between 0°C and +50°C. Operating in ambient temperatures beyond these limits could affect the accuracy of the instrument and cause damage to its circuits and the r.f. oscillator.

CAUTION...

It is essential to permit a free flow of air to fan at rear of instrument and not to block the air vents on top cover of instrument.

RACK/BENCH CONVERSION

5. The type 6700B is shipped as a bench-type instrument. For bench use the unit is conveniently raised on its four plastic feet. A self-storing tiltstand may be locked into position to raise the front panel for improved viewing.

6. To prepare the unit for rack mounting, refer to Fig. 1 and proceed as follows:

(1) Undo screws A (8 off), remove lower cover.

(2) Remove rear feet, front feet, and tiltstand.

(3) Replace lower cover.

(4) Remove decorative strip from front handle bracket and fit rack adapter bracket.

Rack adapters are available as an accessory kit.

REPACKING FOR SHIPMENT

7. To protect the unit during reshipment always use the best packaging methods available. When possible, use the original packing container and cushioning material. Make certain the plug-in r.f. unit is securely locked in position and held there by cushioning material, if installed in the mainframe during shipment. If the original packing materials are not available, use the following procedure:

(1) Wrap instrument in sturdy paper or plastic.

(2) Place wrapped instrument in a strong shipping container; use a 20 mm layer of shock absorbing material around all sides of the unit to provide a firm cushion and prevent movement inside the container.

(3) Thoroughly seal shipping container and mark it as "FRAGILE".

(4) If shipping for service attach a note to indicate:

a) Service required.
b) Description of malfunction.
c) Type and serial numbers.

d) Return address.
e) Authorization to conduct repairs.

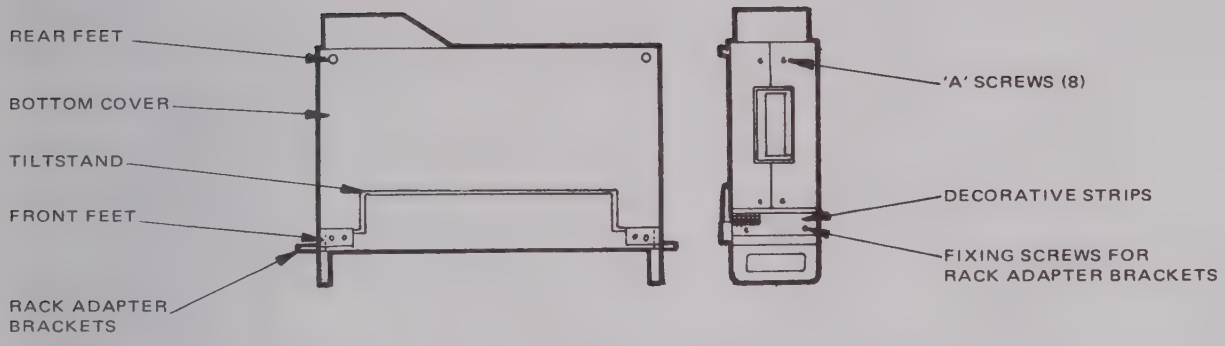

Fig. 1 Conversion for rack mounting

Chapter 3

OPERATION

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INTRODUCTION

1. This chapter provides a detailed description of the type 6700B Sweep Oscillator's operating controls, indicators and connectors, and contains the procedures for operating the instrument. It also describes the controls and indicators located on the r.f. unit. (Refer to the applicable r.f. unit instruction manual for a detailed description of the unit).

2. The type 6700B, a versatile r.f. signal source of both swept and static frequencies, provides four sweep modes: automatic, single, manual and external. The mainframe and eight basic r.f. units (see Chap. 1, Table 1) provide a continuous range of coverage from 10 MHz to 18 GHz.

FRONT AND REAR PANEL FAMILIARIZATION

Front panel

3. Fig. 1 illustrates and explains the function of all front panel fixtures for both the mainframe (encircled numbers) and an r.f. unit (encircled letters). Additional information regarding the proper use of the controls is provided in paras. 5 onwards.

Rear panel

4. The identification and function of connectors and controls located on the rear panel for both the mainframe (encircled numbers) and an r.f. unit (encircled letters) are shown in Fig. 3-2.

OPERATING CONSIDERATIONS

5. Information regarding operating features of the type 6700B and of the r.f. plug-in unit is provided in the following paragraphs. A complete understanding of these considerations and their effects is recommended before using the instrument as a signal source.

CAUTION...

It is essential to permit free flow of air around the fan on the rear of the 6700B and not to block the air vents on top cover of instrument.

APPLYING POWER

6. Moving the power switch to the ON position causes the neon indicator to light indicating that the instrument is ready to operate provided that an r.f. unit is installed. There is no waiting period for operation.

SWEEP MODES

Automatic

7. One of four automatic sweep times can be selected by setting the SWEEP TIME (SEC) control to either .01, .1, 1, or 10 and setting the SWEEP FUNCTION control to M1-M2, F1-F2 or SYM M1. The SWEEP TIME (SEC) settings are accurate only if the VARIABLE control is set to CALIBRATED (fully clockwise). Rotating the VARIABLE control from fully clockwise to fully anti-clockwise increases the sweep time from one to ten times the interval indicated (.01, .1, 1, or 10) with a maximum sweep time of 100 s. The SWEEP ON indicator will light during the forward sweep.

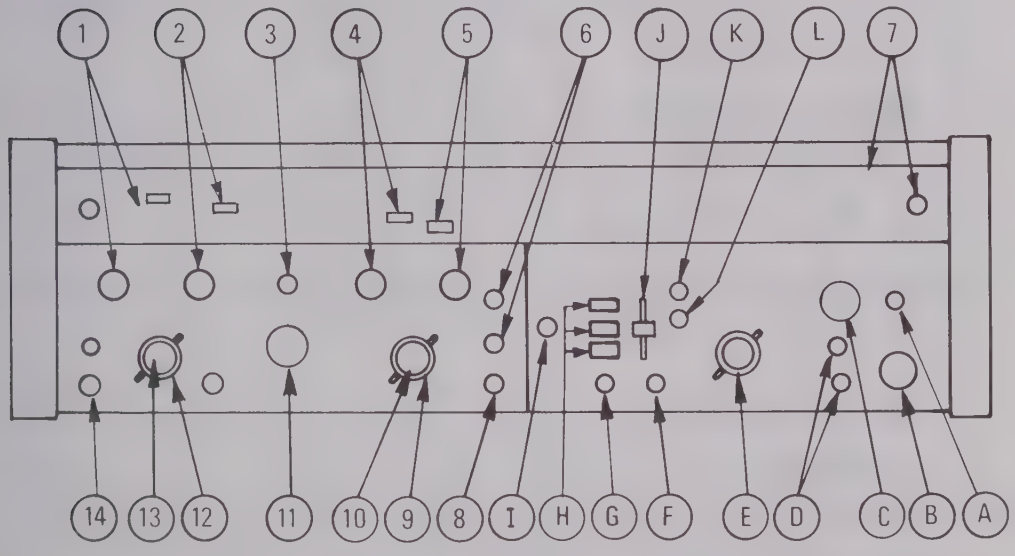

Fig. 1 Front panel controls and connectors

(1) F1 control and marker: Determines starting frequency for F1-F2 setting of SWEEP FUNCTION control and marker frequency in remaining settings except for CW M1 and EXT/M1.

(2) M1 control and marker: Determines (a) marker frequency for F1-F2, (b) sweep starting frequency for M1-M2, (c) centre frequency for SYM M1, and (d) sweep starting frequency for EXT/M1 positions of SWEEP FUNCTION control.

(3) SWEEP ON: Indicator lights during forward trace only of internally generated sweep, but is inoperative on manual sweep mode and on EXT/M1 mode.

(4) M2 control and marker: Determines (a) second marker frequency for F1-F2, (b) the only marker frequency for EXT/M1, and (c) sweep limit frequency for M1-M2 positions of SWEEP FUNCTION control.

(5) F2 control and marker: Determines (a) sweep limit frequency for F1-F2, and (b) marker frequency for both M1-M2 and SYM M1 settings of SWEEP FUNCTION control.

(6) 1 kHz ⊓⊔ ON switch and adjustment: Controls voltage to square wave generator; adjustment varies frequency of square wave.

(7) Frequency scale and retaining screws: 350 mm scale (one per r.f. unit). Keyholes in scale locate over screws on front panel.

(8) SWEEP OUT: Connector provides a linear d.c. ramp voltage for driving the horizontal axis of oscilloscope or chart recorder.

(9) SWEEP TIME (SEC): Selects one of four sweep times; also selects manual mode.

(10) SWEEP TIME (SEC) VARIABLE: Vernier provides adjustment of selected sweep time. Fully anti-clockwise setting increases sweep time by a factor of 10. In the manual mode, the vernier is used to vary the sweep manually.

(11) SWEEP FUNCTION: Selects an internal mode, CW or external frequency (voltage) command.

(12) TRIGGER: Selects either AUTO, LINE, manual push-button or EXT mode for starting the sweep.

(13) MARKER AMPLITUDE: Provides continuous amplitude adjustment for video and r.f. markers.

(14) SUPPLY ON: Controls a.c. line power; up for ON. Neon indicator immediately above.

(A) UNLEVELLED: Indicator lights when r.f. output is not levelled across the entire frequency range in use.

(B) RF OUTPUT: Connector provides r.f. output signal.

(C) RF LEVEL control: Knob sets amplitude of r.f. output.

(D) RF ON-OFF switch and indicator: Controls V_{cc} to r.f. unit; indicator lights when r.f. unit is operating.

(E) SYMMETRICAL SWEEP WIDTH control: Select one of nine calibrated sweep widths. Vernier provides adjustment of the sweep width in 0 - 100% position only.

(F) EXT DET INPUT: Input connector for external levelling signal.

(G) GAIN: Adjustment controls leveller gain in the power meter mode.

(H) LEVELLER MODE controls: Select one of three basic modes of operation: OFF, INTernal or EXTernal. (Internal levelling available only with option-01, except in RF Unit type 6790A in which it is standard).

(I) LOCK: Captive screw secures r.f. unit in mainframe.

Additional features on type 6700B with 6790A plug-in only.

(J) Band switch: Select 0.01-1 GHz, 1-2 GHz or 0.01-2 GHz band.

(K) Band indicator: Light on when frequency is in 0.01-1 GHz band.

(L) Band indicator: Light on when frequency is in 1-2 GHz band.

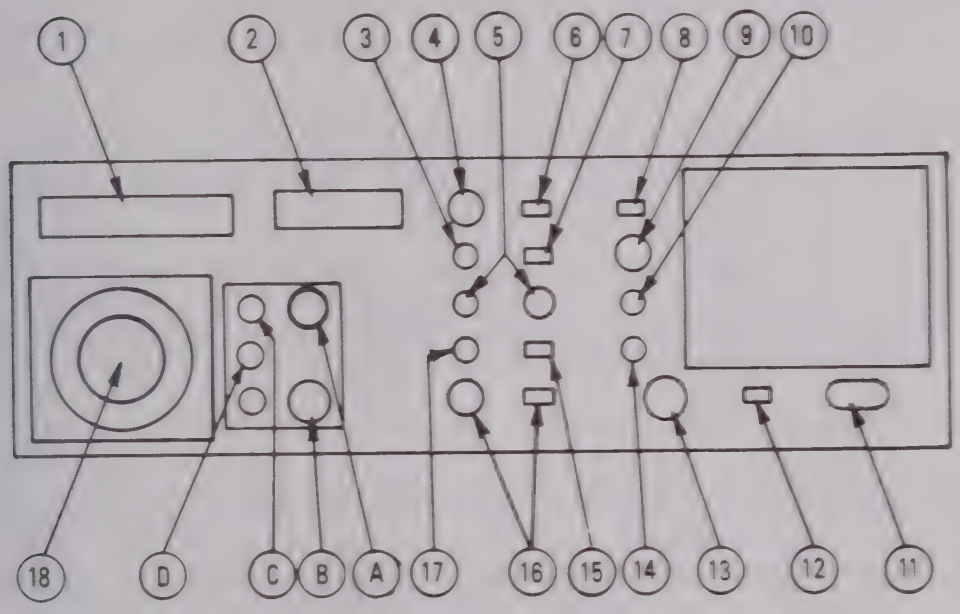

Fig. 2 Rear panel controls and connectors

(1) TB1: Terminals 1 and 2, 8 and 9, 10 and 11, are normally shorted. Terminals 6 to 11 are for remote frequency control.

(2) REMOTE PROGRAMME INPUT: Input connector for remote digital b.c.d. control of output frequency (if option-01 is included) and remote RF ON/OFF control.

(3) BLANKING OUTPUT: Connector provides a negative pulse during retrace and prior to initiation of next trace, also during automatic band switching in 0.01-2 GHz operation of type 6790A.

(4) EXT SWEEP INPUT: Input connector for 0 to +10 V input sweep command.

(5) DISPLAY SWEEP OUTPUT and AMPLITUDE: Output is identical to front panel SWEEP OUT; control adjusts amplitude of both front and rear panel SWEEP OUTPUT signals.

(6) SWEEP RESPONSE TIME: Switch controls bandwidth of tuning supply. In AUTO the bandwidth is automatically adjusted according to rate of change of the input voltage; in FAST the bandwidth always remains at its widest, except in CW operation.

(7) RF DURING TRACE: Switch provides a choice of RF ON or OFF during retrace.

(8) SYM MARKERS/DWELL TIME: Switch selects CALIBRATED MARKERS, read from the frequency scale, or RELATIVE markers of constant narrow width in SYM M1 mode. It also gives choice of pre-sweep dwell time - SHORT (normal) or LONG for compatibility with network analysers.

(9) PEN LIFT: Terminal provides a relay closure signal during forward trace.

(10) EXT SQUARE WAVE: Input connector for external square-wave modulation of RF; -10 V turns off r.f. power.

(11) AC SUPPLY: 3-wire male connector.

(12) AC INPUT SELECTOR: Switch selects 105-125 V or 210-250 V operation.

(13) AC input fuse: 115 V/3.15 A or 230 V/1.6 A. Anti-surge fuses, 20 mm x 5 mm.

(14) EXTERNAL TRIGGER: Connector for -10 V input trigger signals.

(15) MARKER switch: In ON position, markers appear as amplitude dips on the r.f. output.

(16) PROPORTIONAL OUTPUT and switch: Connector provides a voltage proportional to the frequency of the instantaneous r.f. output. Switch selects either 10 V/BAND or 40 V/OCTAVE scale factor for the proportional output voltage.

(17) VIDEO MARKER OUTPUT: Connector provides a negative signal when the r.f. and marker frequencies coincide. MARKER switch does not affect this output.

(18) COOLING FAN: Blows cold air on to r.f. unit heat sink.

(A) J1: Input connector for a remote tuning input. Remove external jumper between pins A,B. Also (when used with plug-in 6790A only) remote band selection.

(B) RF OUTPUT: This connector only present on r.f. units with "R" option.

(C) AM INPUT: Input connector for amplitude modulation signals.

(D) FM INPUT: Input connector for frequency modulation and phase locking signals.

SWEEP TRIGGER SELECTION

Automatic

8. With the TRIGGER selector set to AUTO, the sweep is automatically re-started upon completion of a retrace, i.e. recurrent free-running operation. A short dwell time is provided at the start and finish of each trace to allow r.f. frequency and power to stabilize. A switch position is provided to increase the pre-sweep dwell when the 6700B is used in conjunction with a network analyser.

Line

9. In the LINE position, a sweep is triggered by the occurrence of the next line frequency cycle following completion of retrace.

External

10. Setting the TRIGGER selector to EXT allows a -10 V signal, applied to the EXTERNAL TRIGGER connector on the rear panel, to trigger a new sweep upon receipt of the next negative going external trigger signal following completion of retrace.

Single sweep

11. Rotating the TRIGGER selector fully clockwise and pressing the adjacent push-button switch generates a single sweep. A second manual sweep can be initiated by pressing the push-button again following completion of retrace.

SWEEP FUNCTION MODES

F1-F2 mode

12. With the SWEEP FUNCTION selector set to F1-F2, the output frequency sweeps between the limits set by the F1 and F2 controls. Normally the low frequency limit is set by F1 and the high limit by F2, resulting in a sweep that goes from a low to a higher frequency. However, F1 can be used to set the high limit and F2 for the low limit, thereby establishing a high to low frequency sweep.

13. Two calibrated markers are controlled by the M1 and M2 controls, each continuously adjustable over the entire frequency range.

M1-M2 mode (expanded sweep)

14. The M1 and M2 markers provide the means of selecting any portion of the F1-F2 frequency range for expanded display. With the SWEEP FUNCTION selector set to M1-M2, the frequency range established by the two markers becomes the full width of the swept frequency display. F1 and F2 may be used to provide markers if they are brought within the M1-M2 range.

SYM-M1 mode (symmetrical sweep)

15. Setting the SWEEP FUNCTION selector to SYM M1 and adjusting the M1 control to position the M1 marker to the desired frequency will cause the trace to sweep symmetrically about the centre frequency established by M1. The total sweep width (peak-to-peak excursion) is determined by the setting of the SYMMETRICAL SWEEP WIDTH control located on the front panel of the r.f. unit.

16. When the SYM MARKERS switch located on the rear panel is set to CALIBRATED, F1 and F2 markers are directly calibrated by the frequency scale and cover the entire frequency range of the r.f. unit. Positioning the SYM MARKERS switch to RELATIVE causes the markers to become quite narrow ranging only over the symmetrical sweep frequency width in use. Frequency scale readings at the markers do not apply in this condition.

17. The symmetrical mode is convenient for making narrow-band measurements since the frequency excursion is calibrated to within ±3% of the SYMMETRICAL SWEEP WIDTH range selected (±10% for varactor-tuned units 6730A, 6790A). For narrow sweep width this is substantially more accurate than the markers. The SYMMETRICAL SWEEP WIDTH selector provides nine convenient steps from approximately 0.2% to 100% of the sweep range for the r.f. unit. Rotating the selector fully clockwise activates the concentric control which is used to vary the sweep width continuously over the full frequency range.

18. The symmetrical mode may also be used as an expansion of the F1-F2 mode, when the M1 marker is set to the centre of that portion of the F1-F2 display to be expanded.

19. The centre frequency may also be remotely controlled via the terminal strip (TB1 , Fig. 2) located on the rear panel. When jumpers linking terminals 8 to 9 and 10 to 11 are removed, remote voltage from 0 to -10 V (applied to terminal 9 with respect to terminal 7) will linearly control the centre frequency over the full range. A potentiometer (1 kΩ recommended) or a resistor divider placed at terminals 7, 9 and 11 will also determine the centre frequency over its full range.

20. If several centre frequencies are required, an external switch or push-button control can be used to select from a number of remote programming voltages, potentiometers or resistor divider networks.

CW M1 mode

21. When the SWEEP FUNCTION selector is set to the CW M1 position the automatic sweep mode is disabled and the output frequency is determined by the setting of the M1 control. The SWEEP ON indicator does not function in this mode.

22. With the SWEEP FUNCTION selector set to F1-F2, the M1 marker may be preset to a frequency of interest. When the SWEEP FUNCTION selector is placed in the CW M1 position the sweep will automatically stop at the frequency identified by the position of the M1 marker.

23. Remote frequency programming may be accomplished via the rear terminal strip as described in para. 48.

EXT/M1 mode

24. When the SWEEP FUNCTION selector is set to the EXT/M1 position, the automatic sweep is disabled and the output frequency is determined by an external voltage applied to the EXT SWEEP INPUT connector (located on the rear panel) and the setting of the M1 control. An analog voltage from 0 to +10 V will control the frequency over the entire range of the r.f. unit. The SWEEP ON indicator does not function in this mode. One calibrated marker, M2, is controlled by the M2 control and is continuously adjustable over the entire range.

SWEEP RESPONSE TIME CONTROL

25. With the SWEEP RESPONSE TIME switch (located on the rear panel) set to AUTO, the response (bandwidth) of the tuning supply is automatically adjusted according to the rate of change of the input tuning voltage - whether internally or externally generated. In this manner a minimum noise bandwidth is maintained to ensure the lowest possible residual f.m. regardless of sweep rate. Setting the SWEEP RESPONSE TIME to FAST forces the bandwidth to remain at its widest width at all times.

RF LEVEL

26. The continuously variable RF LEVEL control (front panel) is used to vary the amplitude of the r.f. output. Maximum r.f. output level is obtained by rotating the RF LEVEL fully clockwise. The LEVELLER MODE OFF pushbutton should be depressed unless levelled power is required.

RF POWER LEVELLING

27. The type 6700B with any r.f. unit installed is capable of maintaining a constant amplitude r.f. output across the frequency range. This is accomplished by comparing the d.c. level from an r.f. amplitude sampling device with the amplitude command of the RF LEVEL control. The difference (or error) is amplified and applied to a current-controlled attenuator which reduces the amplitude of the r.f. output to the desired level.

28. The RF LEVEL control sets the maximum amplitude of r.f. power across the frequency range. Consequently, the r.f. output will be levelled in those portions of the frequency band where there is sufficient r.f. power but will remain unlevelled in any portion where the amplitude of the r.f. power falls below the level demanded by the RF LEVEL control. The UNLEVELLED indicator will only be illuminated during those portions of the sweep that are not levelled.

Internal levelling

29. No external equipment is required to provide levelled r.f. power when using an r.f. unit featuring internal levelling circuitry. These units have an internal directional detector consisting of a flat broad-band directional coupler with a crystal detector. To activate the internal levelling function, simply depress the front panel LEVELLER MODE INT pushbutton and adjust the RF LEVEL control so that the UNLEVELLED indicator lamp remains extinguished over the frequency range in use.

External crystal levelling

30. The output from any r.f. unit may be levelled at a location outside the r.f. unit by using a remote r.f. amplitude sampler. This is especially desirable at the higher microwave frequencies to assure flat power at the input to the device under test. External levelling is also used to remove any power variations which may otherwise be introduced by a device inserted in the r.f. path such as a filter, an amplifier or a long transmission line.

31. A broadband directional coupler (typically 10 dB) and crystal detector are connected in the r.f. path to take a sample of the r.f. power. The detector output is connected to the front panel EXT DET INPUT socket on the r.f. unit and the LEVELLER MODE EXT button depressed. Either positive or negative polarity detectors may be used.

32. For optimal results over a frequency range of less than 2:1, a low pass filter with cut-off frequency at the high end of the desired band may be inserted before the directional coupler. The influence which any small harmonic content of the r.f. signal might have on levelling is thus prevented.

Power meter levelling

33. The ultimate in levelling accuracy and flatness across a broad band is obtained by substituting a thermistor r.f. power meter for the crystal detector as discussed in para. 31. The long response time, however, of power meter thermistor mounts restricts sweep time selection to the two slower ranges, 1 and 10, of the SWEEP TIME (SEC) control. These two ranges are also suitable for use in conjunction with an X-Y recorder or with oscilloscopes other than the long persistence display types.

34. The power meter should have a minimum output of 1 V or 1 mA. Either polarity may be used. Typically, a 10 dB directional coupler and a low pass filter are used in the same manner as described in para. 31. A levelled output power indication is calculated by adding the directional coupler's coupling factor in dB to the power meter indication. The output power indication is influenced by both the front panel RF LEVEL control setting, and the range selected for the power meter. It might be necessary to readjust the gain control when changing settings of the power meter range switch.

35. When square wave modulation is used the levelling action of the power meter maintains constant (average) power. Since the duty factor of the internal square wave is 50%, the peak r.f. power will be twice the value indicated by the average reading on the power meter.

36. To minimize transients at the start of sweep, it is recommended that the RF DURING RETRACE switch (located on the rear panel) be placed to ON. Refer to para. 39 for more details.

FREQUENCY MARKERS

37. Two independent calibrated frequency markers are generated for each sweep mode except for the EXT/M1 mode. These markers are available as negative video signals at the VIDEO MARKER OUTPUT connector located on the rear panel. The marker waveforms may be displayed on the second channel of a dual trace oscilloscope or X-Y recorder, or used as an oscilloscope intensity variation signal.

38. Placing the RF MARKER switch (rear panel) to ON causes the r.f. markers to be displayed as sharp dips in r.f. power. Marker amplitude is varied by the continuously adjustable MARKER AMPLITUDE control located on the front panel.

BLANKING DURING RETRACE

39. When the RF DURING RETRACE switch (rear panel) is set to OFF, the r.f. power is turned off during retrace of the internally generated sweep. This feature provides a zero power reference base line for the r.f. display. Dwell time is also provided at both start and finish of sweep. Setting the switch to ON provides r.f. power during both trace and retrace. This is useful for power meter levelling set-ups and for chart recorder operation since it eliminates large changes in amplitude at the beginning and end of sweep.

40. A negative video pulse covering the whole retrace and dwell periods is present at the BLANKING OUTPUT connector. In addition, a contact closure during forward trace is available at the PEN LIFT terminal for use with recorders having the capability to discontinue writing during retrace. The PEN LIFT contacts automatically remain open in MANual sweep mode, the .1 and .01 SEC SWEEP TIME settings, and when primary power is off.

AMPLITUDE MODULATION

Internal square wave

41. The internal 1 kHz square wave generator, especially useful with a tuned detection amplifier, may be activated in any mode by setting the 1 kHz ⊓⊔ switch to ON. The associated front panel screwdriver adjustment provides the means to change the frequency over a range from 950 to 1050 Hz. The oscillator, which provides 100% modulation, produces a peak r.f. power identical with square-wave-off power except when using power meter levelling when the average power remains the same and may require resetting the RF LEVEL control to maintain peak power within the r.f. unit's maximum output capability.

External a.m.

42. An external amplitude modulating signal may be applied to the AM INPUT connector located on the rear panel of the r.f. unit. External modulation signals are mixed directly with the output of the RF LEVEL control circuit. Amplitude distortion of the modulation is minimal when XTAL levelling is used. Power will remain linear with an external amplitude modulating signal when power meter levelling is employed, but frequency response is somewhat limited. Adjusting the RF LEVEL control will centre the dynamic range of the amplitude modulation.

External pulse

43. Pulse modulation input signals are applied to the AM INPUT connector on the rear panel of the r.f. unit. When this input is being used, make sure the RF LEVEL control is rotated fully anti-clockwise to ensure that the r.f. amplitude remains low except during a pulse. The LEVELLER MODE OFF pushbutton must be depressed.

DISPLAYING SWEPT FREQUENCY MEASUREMENTS

44. For rapid evaluation or adjustment of a device under test, the oscilloscope is generally the most convenient display method. A simple set-up using a broad-band crystal detector, a pad and an oscilloscope is illustrated in Fig. 3.

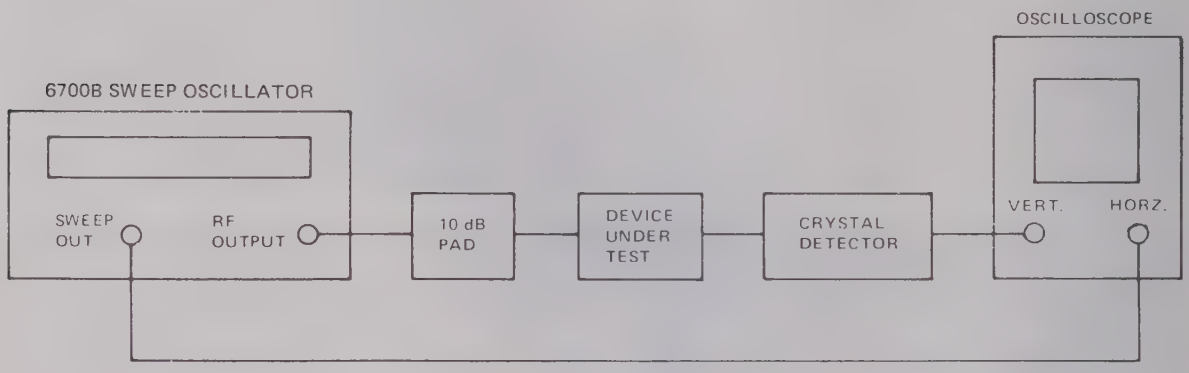

Fig. 3 Swept frequency measurement test set-up using an oscilloscope display

45. The r.f. output, after passing through the pad and the device under test, is converted to a video signal by the crystal detector and applied to the vertical input of the oscilloscope. The pad is used to provide a proper source match and to reduce the power level so that the detector operates within its square law region. A sweep signal from either the front panel SWEEP OUTPUT connector or the rear panel DISPLAY SWEEP OUTPUT connector is used to provide the horizontal drive for the oscilloscope. The DISPLAY SWEEP AMPLITUDE control, located on the rear panel of the mainframe, or the horizontal gain control on the oscilloscope may be used to adjust the display width.

Note...

Measurements will be enhanced by levelling, as discussed in para. 27.

46. An X-Y recorder may also be used to obtain a permanent record of the evaluation or adjustment of the device under test. As shown in Fig. 4, the test set-up using the recorder is very similar to the one for the oscilloscope. The SWEEP TIME (SEC) control must be set to either 1 or 10 and the vernier adjusted to meet the response time of the recorder. If the recorder has a pen lift or equivalent writing enable-disable feature it should be connected to the rear panel PEN LIFT terminal on the mainframe to prevent chart marking during retrace.

47. The recorder X and Y scale factors and zero suppression may be conveniently adjusted by setting the SWEEP TIME (SEC) selector to MAN and rotating the associated concentric VARIABLE control knob.

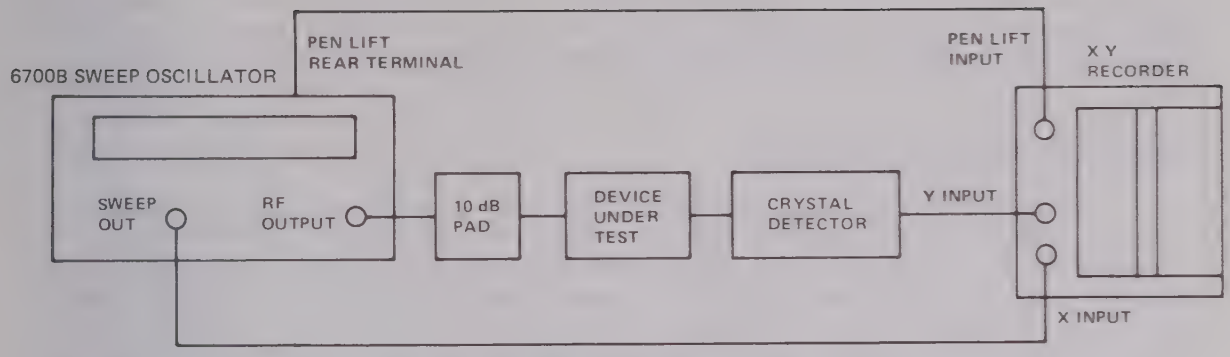

Fig. 4 Swept frequency measurement set-up using an X-Y recorder display

REMOTE PROGRAMMING OF FREQUENCY AND AMPLITUDE

48. The type 6700B sweep oscillator may be remotely controlled by using an external negative or positive going analogue voltage, a potentiometer, or b.c.d. logic level (option-01) to determine the output frequency and the power level. Wideband remote frequency control e.g. phase locks, must be applied via the r.f. unit rear panel FM INPUT connector. Frequency deviation is superimposed on the output frequency determined by the other inputs and controls.

Frequency - analogue voltage control

49. Remote control of the output frequency through the use of a 0 to +10 V signal, that may be either d.c. or a special waveform, is accomplished by setting the SWEEP FUNCTION selector to EXT/M1 and applying the input control voltage to the rear panel EXT SWEEP INPUT connector. The F1 and F2 controls are inoperative, but the M2 control still sets the M2 marker. In this mode the M1 control determines the 0 V start frequency.

50. To effect frequency control by using a 0 to -10 V signal requires setting the SWEEP FUNCTION selector to CW M1, or if the remote signal is being modulated then set the SWEEP FUNCTION selector to SYM M1. Remove the jumper from terminals 8 and 9 of TB-1 (located on the rear panel) and connect the input signal to terminal 9 and the signal return to terminal 7. (If a shielded cable is used connect the shield to terminal 6). The internal electronic sweep provides a calibrated symmetrical sweep, having a width set by the SYMMETRICAL SWEEP WIDTH control located on the r.f. unit, that sweeps about the centre frequency determined by the input control voltage. The M1 control is ineffective; F1 and F2 controls still provide markers. If desired, the internal electronic sweep may be disabled by setting the SWEEP TIME (SEC) selector to MAN, or by setting the TRIGGER selector to EXT and positioning the SYMMETRICAL SWEEP WIDTH control fully anti-clockwise.

51. Rear panel connector J1 on the r.f. unit may also be used as an input for a remote control voltage. This input may be used alone or in conjunction with any of the remote programming techniques being discussed.

52. A voltage applied to pins A and B (signal to B and return to A) of connector J1 operationally adds to the output frequency in every mode. This feature may be especially convenient when used as a vernier control about a preset frequency. A 10 V change covers the entire frequency band of the r.f. unit with an increase in frequency corresponding to a more positive voltage level.

Frequency - resistance control

53. Controlling the output frequency by means of external resistors is accomplished by connecting a resistance divider or a potentiometer (1 kΩ recommended) to terminal strip TB1 located on the rear panel. Connect the external resistance to terminals 7, 9 and 11 as illustrated just below the terminal strip. Set the SWEEP FUNCTION selector to CW M1, or if the remote signal is being modulated, set the SWEEP FUNCTION selector to SYM M1. The internal sweep provides a calibrated symmetrical sweep, having a width set by the SYMMETRICAL SWEEP WIDTH CONTROL located on the r.f. unit, that sweep about the centre frequency determined by the input control signal. The M1 control is ineffective; F1 and F2 controls still provide normal markers. The automatic sweep may be disabled by setting the SWEEP TIME (SEC) to MAN, or by setting the TRIGGER selector to EXT. Since the remote resistance divider replaces the function of the M1 control, this type of set-up permits remote marker control in the F1-F2 mode, and remote sweep start control in the M1-M2 mode.

Frequency - digital control

54. To implement remote control via externally generated digital signals requires that the option-01, which is a plug-in p.c. card, be installed in the mainframe. The REMOTE PROGRAMMING INPUT connector, a 36-pin rear panel mainframe connector, provides twelve digital input lines for a remotely generated 3-digit b.c.d. word used to determine the frequency. One input line, remote enable, is provided to control the mode of operation - either local or remote. A second input line is provided for strobing the 12-line 3-digit b.c.d. input lines. If the strobe line remains open (a logic "1" condition) any 12-bit word present at the input lines will determine the output frequency. Placing a ground (a logic "0" condition) on the strobe line causes the unit to hold the last 12-bit word, regardless of the state of the 12 input lines, until the strobe line changes to a logic "1" condition. This feature allows a given 12-bit word, corresponding to a specific frequency, to be held in memory as long as the strobe input line remains at a logic 0, even though the digital word on the 12 lines may be changing.

55. One additional line is provided for remote control of the RF ON/OFF switch on the front panel of the r.f. unit. Grounding this line shuts off the r.f. source power. Leaving the line open or at +5 V turns on the r.f. source power. This line is standard equipment on the type 6700B and is not part of the option-01 for the mainframe.

RF amplitude - voltage and resistance control

56. The amplitude of the r.f. output signal is easily controlled by simply applying a command input voltage to the AM INPUT connector located on the rear panel. An analogue voltage of either 0 to +5 V or 0 to -5 V, will cause the amplitude to change across its entire range with a negative going voltage corresponding to a decrease in the output power level.

FREQUENCY MODULATION

External f.m.

57. An external frequency modulating signal may be applied to the FM INPUT connector located on the rear panel of the r.f. unit. Positive going voltages cause the frequency to increase with respect to the centre frequency and negative going voltages cause the frequency to decrease with respect to the centre frequency. For this mode of operation, the SWEEP FUNCTION selector switch on the front panel of the mainframe should be set to the SYM M1 position; the SWEEP TIME switch set to MAN and the SWEEP RESPONSE TIME slide switch on the rear panel of the mainframe should be set to FAST. Set the SYMMETRICAL SWEEP WIDTH switch on the plug-in unit to the fully anti-clockwise position. The M1 control will be used to set the centre frequency. The input impedance at this port is approximately 5 kΩ to ground. The input/output relationship for YIG tuned r.f. units is as follows:-

6738A	20 MHz/V
6742A	20 MHz/V
6754A	40 MHz/V
6766A	44 MHz/V
6774A	56 MHz/V

A typical figure for varactor-tuned units (6730A and 6790A) is 10 MHz/V.

Phase locking

58. Phase locking is possible by applying the error signal from an external frequency stabilizer to the FM INPUT connector. For this mode of operation, the SWEEP FUNCTION selector switch on the front panel of the mainframe should be set to the SYM M1 position, the SWEEP TIME switch set to MAN and the SWEEP RESPONSE TIME slide switch on the rear panel of the mainframe should be set to FAST. Set the SYMMETRICAL SWEEP WIDTH switch on the plug-in unit to the fully anti-clockwise position.

59. It may be found that phase-lock is more easily accomplished, and the resulting r.f. signal freest from sidebands, if the error signal from the frequency stabilizer is reduced by a potentiometer (10 kΩ recommended) or simply a series resistor of up to 10 kΩ.

Remote band selection (6790A only)

60. For the three operating bands of the r.f. unit type 6790A, facilities are provided for band selection by the front-panel lever switch or via the 10-pin connector on the rear panel. For selection via this connector, the front-panel switch is set to REMOTE and t.t.l. - compatible logic signals applied to the connector as follows:-

Pin C	*Pin D*	*Band selected*
Open or +5V	Open or +5V	0.01 - 2.0 GHz
Ground (0V)	Open or +5V	0.01 - 1.0 GHz
Open or +5V	Ground (0V)	1.0 - 2.0 GHz

COMPATIBILITY WITH NETWORK ANALYSERS

61. When operating at maximum sweep rates, the rear panel SYM MARKERS/DWELL TIME switch should be moved to the RELATIVE/LONG position in order to secure best synchronization between sweeper and analyser.

62. If the analyser is of the type which does not include automatic blanking whenever the r.f. signal is not being swept, the rear-panel BLANKING OUTPUT signal should be connected to the Z-blanking input of the analyser in order to avoid spurious movements of the spot on the display tube during retrace and dwell periods.

Chapter 4

TECHNICAL DESCRIPTION

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INTRODUCTION

1. This chapter contains a brief block level description of the type 6700B mainframe and a detailed description of individual circuits. These descriptions are supported by Fig. 1, a block diagram of both the mainframe and a generalized r.f. unit, and Figs. 2 to 12, simplified circuit diagrams covering selected areas of discussion. Complete circuit diagrams are provided in Chap. 7.

BLOCK DIAGRAM DESCRIPTION

2. The type 6700B mainframe, as shown in Fig. 1, contains sweep generating circuitry consisting of a sweep trigger, sawtooth oscillator, sweep limiter and sweep amplifiers; a frequency marker generator; a square wave generator (for internal amplitude modulation); and a power supply section for generating the various voltages required for both the mainframe and the r.f. unit.

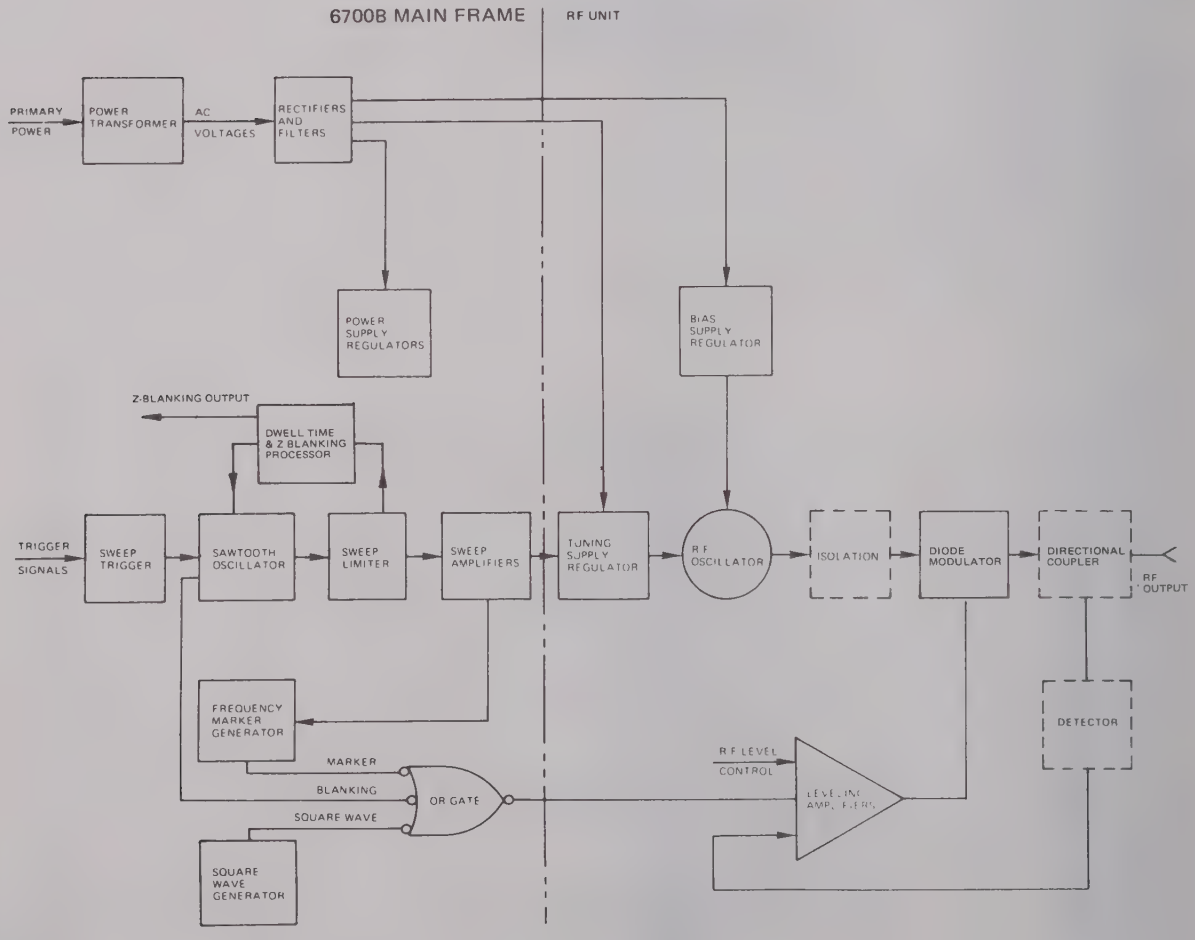

Fig. 1 Block diagram of type 6700B mainframe and r.f. unit

3. The function of the sweep trigger circuit is to reshape and standardize the negative going input trigger signal. The resultant positive output pulse is used to trigger the sawtooth generator which in turn develops a negative sawtooth voltage. This 0 to -12 V waveform, after being inverted and limited to +10 V by the sweep limiter, is applied to the sweep amplifiers which modify the positive going waveform in accordance with the front panel SWEEP FUNCTION control setting. The modified output from the sweep amplifiers is used to drive the tuning supply regulator which in turn controls the r.f. oscillator. As a result, the oscillator sweeps only that portion of its frequency range which corresponds to the sweep amplifiers' output waveform.

4. The amplitude of the r.f. output signal is determined by the electronically controlled attenuation of the diode modulator located in the r.f. unit. The levelling amplifiers section drives the modulator with a control current determined by the setting of the RF LEVEL control. When levelling is in operation, a portion of the r.f. output is sampled by the directional coupler, detected, and fed back to the levelling amplifiers as a negative feedback control signal. As the output frequency is varied, the levelling control loop maintains the detector output at a constant level. The amplitude variation of the r.f. output, therefore, depends only on the characteristics of the directional coupler/detector combination.

5. The frequency marker generator circuit compares a sweep voltage with the marker control voltage to develop marker signals at the corresponding r.f. frequencies. The square wave generator, the retrace blanking signal and the markers, when individually activated by front or rear panel controls, are gated through the OR gate and applied to the levelling amplifiers as modulation.

CIRCUIT DESCRIPTIONS (MAINFRAME)

6. The following discussion covers circuits and controls located on assemblies:

A1 - Sweep and Marker Generator
A2 - Power Supply
A4 - Motherboard
A5 - Trimmer Board

The discussion covering assemblies A4 and A5 is not presented as a separate topic but is included as part of the A1 assembly discussion so that the proper relationship between assemblies may be easily understood.

Sawtooth oscillator (sweep and marker generator)

7. Sweep generation is accomplished by circuitry consisting of a sweep trigger, a sawtooth oscillator, a sweep limiter and sweep amplifiers. Fig. 2 is a simplified circuit diagram of the sawtooth oscillator whose waveform is processed to develop all internally generated sweep waveforms.

8. Setting the SWEEP TIME (SEC) switch (A4A2S1) to one of the four sweep time positions (.01, .1, 1 or 10) inserts a capacitor between the output and the input of IC1A which, with its input resistors, forms an intergrator circuit. A variable reference voltage, applied to one input of IC1A from resistor A4A2R1 via A4R18, develops a 0 to -12 V linear sawtooth output.

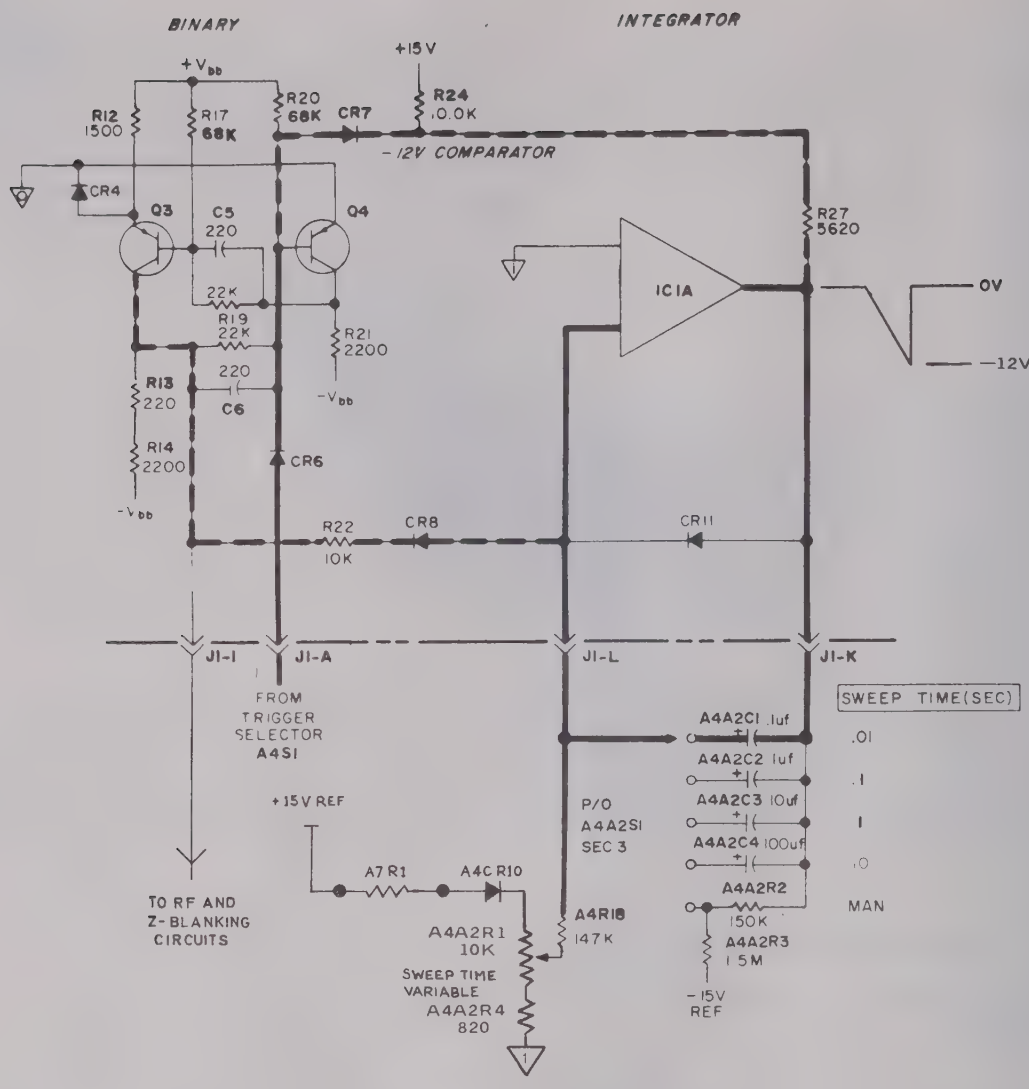

Fig. 2 Sawtooth oscillator, simplified circuit diagram

9. Integrator action is transferred from a forward trace to a retrace when the binary section (bistable multivibrator) is in the reset condition. During forward trace Q3 is conducting and Q4 is cut-off. However, when the output from IC1A reaches -12 V, a comparator consisting of R24, R27 and CR7 drives the base of Q4 negative causing it to conduct. This action resets the binary circuitry and turns Q3 off. The resulting negative potential on the collector of Q3 sets up a large recharging current which flows through R22 and CR8 to the integrator, which causes it to retrace by reversing the direction of current flow. Diode CR11 terminates the sawtooth retrace at approximately 0 V.

10. External or internal trigger signals selected by switch A4S1 are applied through CR6 to the base of Q4. This sets the Q3/Q4 multibrator and initiates the next forward trace and the process is repeated. Generation of the blanking waveform is accomplished by using the collector output from Q3. The collector potential is zero during trace and goes negative during retrace.

Setting switch A4A2S1 to MAN removes the capacitor from the feedback circuit of IC1A and replaces it with resistor A4A2R2. This allows the output level from IC1A to be manually varied from 0 to -12 V which causes the sweep to move at the same rate.

Note...

The following paragraph covers details not included on the simplified circuit diagram of the sawtooth oscillator. For a better understanding it is recommended that Fig. 4 be used as reference.

11. Transistor A4Q1, a lamp driver, is turned on every time Q3 conducts. When A4Q1 conducts, SWEEP ON indicator DS2 is lit indicating that an internally generated sweep is in progress. Normally open relay A4K1 (pen lift) is energized when A4A2S1 is set to either the 1 or 10 s position. In these positions, transistor Q5 conducts through Section 1 of A4A2S1 to energize A4K1. With A4A2S1 set to MAN, the tap on Q3's collector load lies at approximately 0 V, which holds the binary section in its forward trace state without illuminating the SWEEP ON indicator. In addition to the wiper of A4A2S1, Section 3, which selects the capacitor or resistor for the feedback circuit, another wiper provides a discharge path for each integrator capacitor when changing between sweep range settings. It should be noted the RF DURING RETRACE switch (S4), which applies blanking signals to the OR gate depicted in Fig. 1, is set to OFF.

Sweep limiter (sweep and marker generator)

12. Dwell time is provided at the start and finish of the internally generated sweep by limiting the sawtooth so that its sharp peak is flattened as indicated in Fig. 3, a simplified circuit of the sweep limiter section.

13. The negative going sawtooth is applied to pin 6 of IC1B, an operational amplifier with a gain of -1. A small d.c. shift current is applied via R31 to the input of IC1B so that, in the absence of the clamping action of IC2, the output sawtooth of Q6 would go from -1 to +11 V. The output voltage at the emitter of Q6 will, in fact, never go below 0 V because of the "0" V comparator, IC2A. When the input at pin 3 begins to go negative by only a few millivolts, the output on pin 1 immediately goes negative by several volts. This negative voltage is applied through CR13 and R37 to the input if IC1B to negate any further decrease in the input signal. Thus, the most negative output from the emitter of Q6 will never be lower than 0 V.

14. Similarly, the +10 V comparator, IC2B, prevents the output from Q6 exceeding +10 V. When the input at pin 5 of IC2B begins to exceed +10 V by just a few millivolts, the output on pin 7, which is applied via CR16 and R43 to the input of IC1B, goes positive by several volts. This correction signal prevents the output from ever exceeding +10 V.

15. For comparison, the sawtooth input waveform and the sweep limiter output waveform are shown together at the bottom of Fig. 3. The SWEEP OUT signal is taken from the sweep limiter output and used to provide a display sweep synchronous with the internally generated electronic sweep or manual sweep (F1-F2, M1-M 2 and SYM M1 modes) of the output frequency.

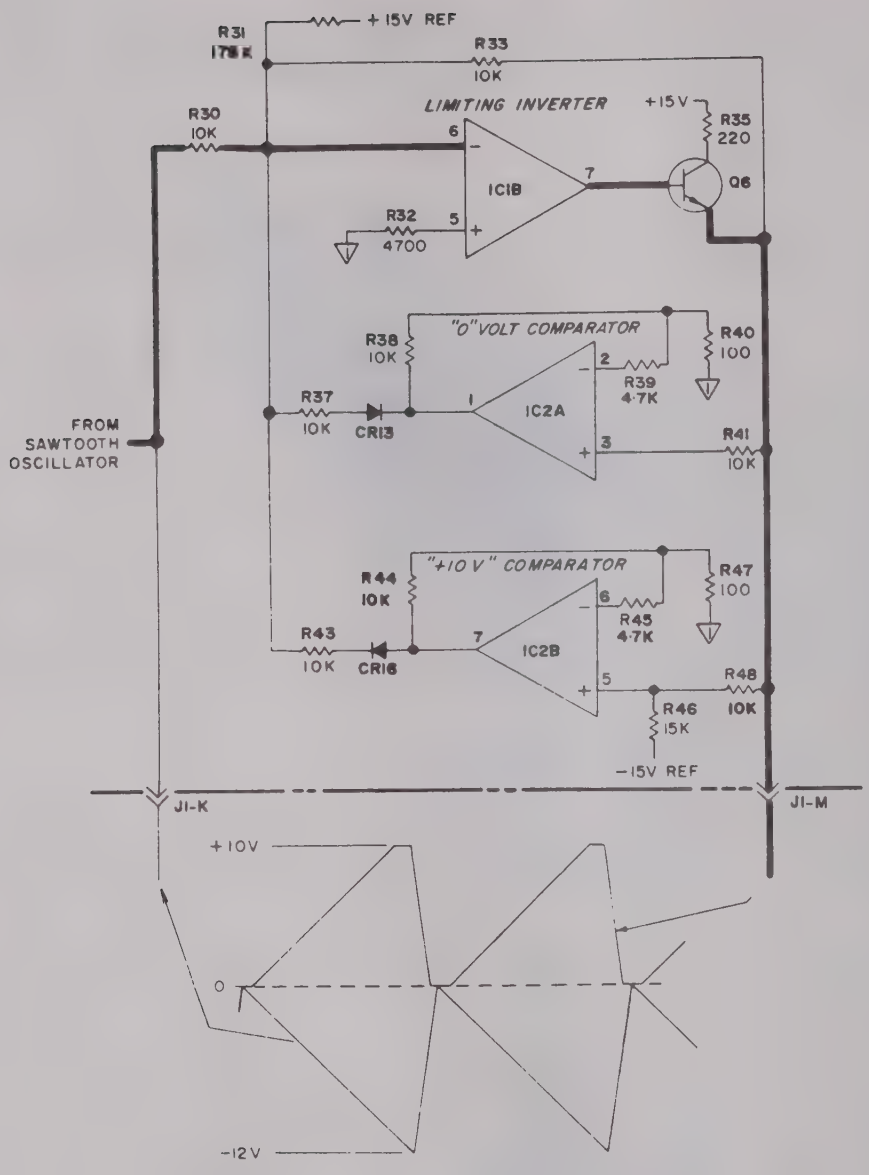

Fig. 3 Sweep limiter, simplified circuit diagram

Sweep trigger (sweep and marker generator)

16. As mentioned in para. 9, the binary section of the sawtooth generator is reset on completion of a forward trace, and remains reset until set again by a sweep initiating trigger signal. The choice of trigger signal is determined by the front panel TRIGGER selector control as illustrated in Fig. 4.

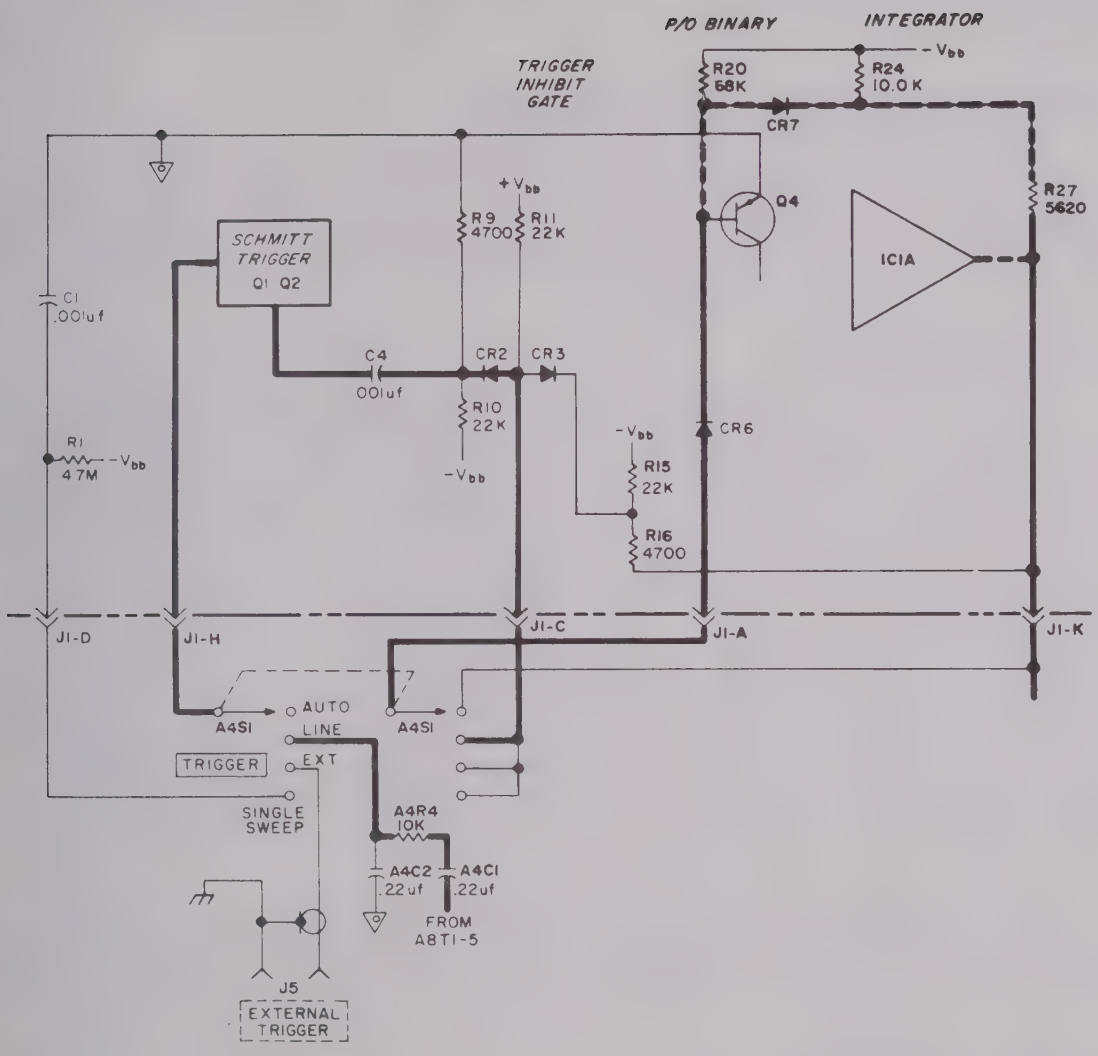

Fig. 4 Sweep trigger, simplified circuit diagram

17. When switch A4S1 is set to EXT, a negative going input signal from the rear panel EXTERNAL TRIGGER connector is routed through A4S1 and applied to the Schmitt trigger circuit for standardization of rise-time and amplitude. The positive going output, after being differentiated by C4 and R9, is applied to a trigger inhibit gate consisting of diodes CR2 and CR3. This gate inhibits the passage of a positive trigger until after integrator IC1A has completed its retrace. This allows the junction of CR2 and CR3 to follow the positive trigger pulse, which is routed through the right hand portion of A4S1 to the base of Q4 which sets the binary section to the forward state.

18. When the TRIGGER selector is set to LINE, a sample of the 50/60 Hz line frequency from T1 is coupled through A4C1 and A4S1 and applied to the Schmitt trigger circuit for standardization. After completion of the retrace, the next cycle of the line frequency will initiate a new sweep.

19. Automatic recurring sweep results when the TRIGGER selector is set to AUTO because the integrator output is then used directly as the input signal which sets the binary section to the forward state. Upon retracing from negative to 0 V, the integrator output becomes positive enough to cut off Q4 via CR7.

Sweep amplifiers (sweep and marker generator)

20. The internally generated sweep tuning waveform applied to the tuning supply regulator section of the r.f. unit is modified by the sweep amplifiers in accordance with the SWEEP FUNCTION selector setting. Each position of the SWEEP FUNCTION selector interconnects the amplifiers and tuning control potentiometers in a distinct configuration.

F1-F2/M1-M2 sweep mode

21. The sweep waveform required at the input to the tuning supply regulator (located in r.f. unit) in both the F1-F2 and M1-M2 modes has its start and finish voltages adjusted to conform with the sweep voltages that correspond to the frequency settings of either M1-M2 or the F1-F2 frequency marker indicators. Fig. 5 illustrates how this is accomplished. Voltage divider A4R11 and A4R12 divides the input sweep waveform by two and shifts the d.c. level. Operational amplifier IC3A doubles the result so that the combination has a gain of +1 with a d.c. shift. A portion of the output voltage from IC3A, as determined by the setting of the F1 (or M1) potentiometer is applied to pin 3 of IC4A. At the same time, the input is applied to pin 6 of IC3B which inverts the waveform but does not introduce a d.c. shift. Again, a portion of the output from IC3B is applied through potentiometer F2 (or M2) to pin 5 of IC4B. The two outputs from voltage followers IC4A and B are combined and summed by IC5A which has a gain of -1. Thus, the starting value and the finish value of the sweep voltage are proportional to the setting of F1 (M1) and F2 (M2) potentiometers, respectively.

22. The direction of sweep is always from F1 (M1) to F2 (M2). For normal operation F1 (M1) is generally set to a lower frequency than F2 (M2). However, F1 (M1) may be set higher in frequency than F2 (M2) by a cross-over of their indicators. The output will then sweep from a higher to a lower frequency.

Symmetrical sweep mode (SYM M1)

23. In the SYM M1 mode, the sweep amplifiers are connected as shown in Fig. 6. The input sweep waveform is applied to pin 6 of variable gain amplifier IC3B. The amplitude of the output on pin 7 is determined by the setting of the SYMMETRICAL SWEEP WIDTH control located on the r.f. unit. A d.c. offset current (equivalent to a 5 V shift in the sweep input waveform is applied via A4R13 to balance the output sawtooth of IC3B about 0 V. After passing through voltage follower IC4B, the sweep waveform is combined with the d.c. level established by the M1 potentiometer and applied to summing amplifier IC5A. In this way the centre frequency is set by the position of the M1 control and the excursion is established by the SYMMETRICAL SWEEP WIDTH control.

External/M1 sweep mode (EXT/M1)

24. In the EXT/M1 sweep mode, the sweep amplifiers are connected as shown in Fig. 7. The external input applied to rear panel EXT SWEEP INPUT connector is fed to pin 2 of IC3A whose output is used to drive voltage follower IC4B. The output from pin 7 of IC4B is combined with the d.c. level established by the M1 control and summed by amplifier IC5A. The tuning supply output voltage

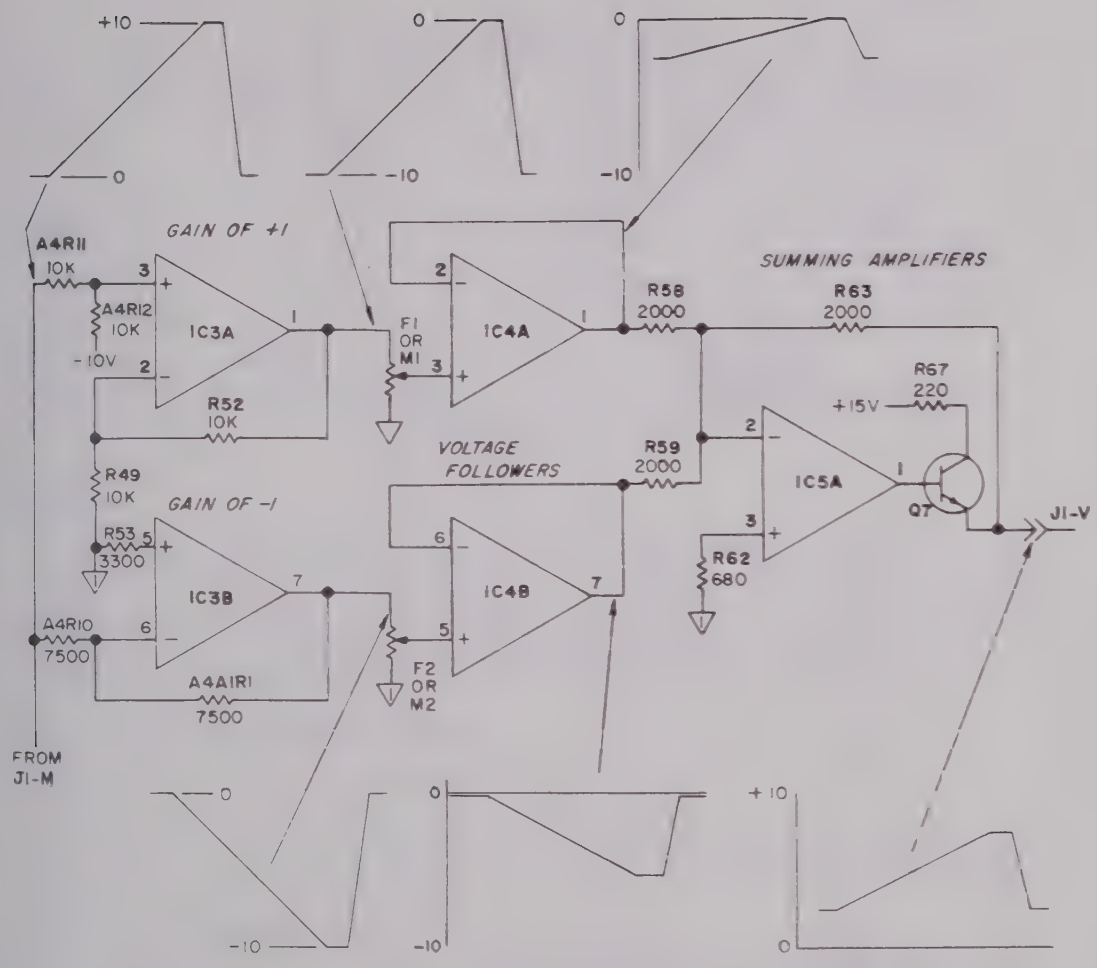

Fig. 5 Sweep amplifier (F1-F2/M1-M2 modes), simplified circuit diagram

from pin 1 of summing amplifier IC5A represents the algebraic sum of the d.c. level from the M1 control and the external sweep input signal. The operator may vary the external sweep input voltage between 0 and +10 V to cause a corresponding change in the output frequency. It should be noted, however, that the resulting frequency is determined by both the external input signal and the M1 control setting. The amplifier chain, which duplicates the tuning supply input, applies this combined signal to the frequency marker circuit so that the M2 marker may be generated.

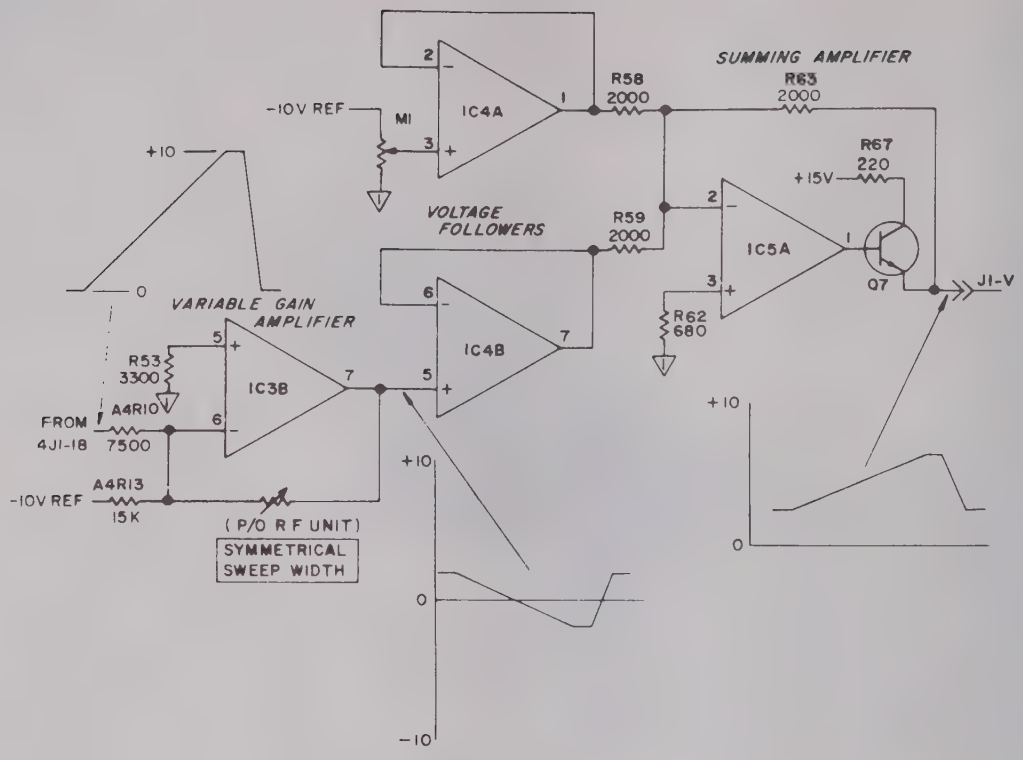

Fig. 6 Sweep amplifier (SYM M1 mode) simplified circuit diagram

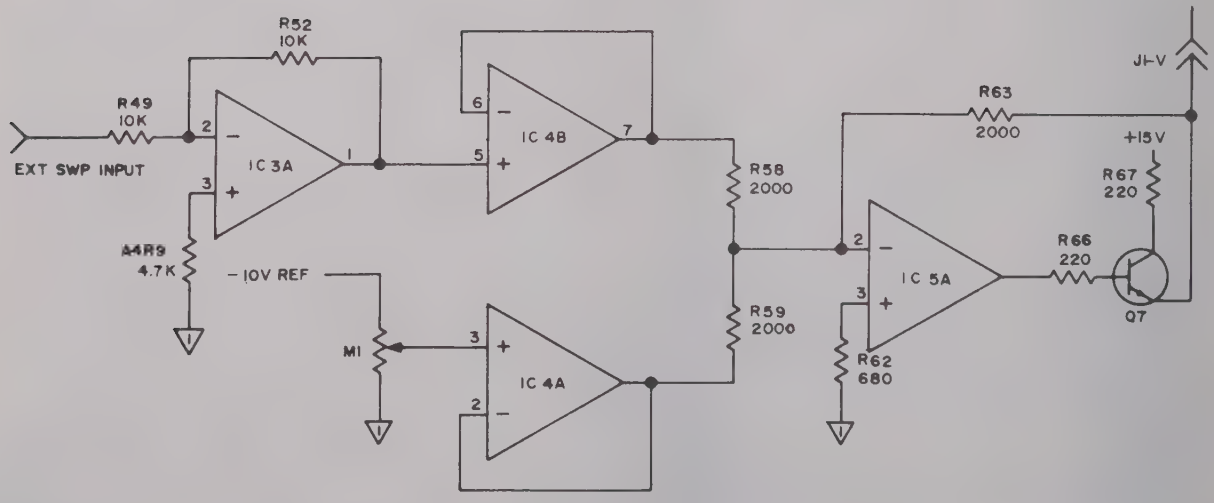

Fig. 7 Sweep amplifier (EXT/M1 mode) simplified circuit diagram

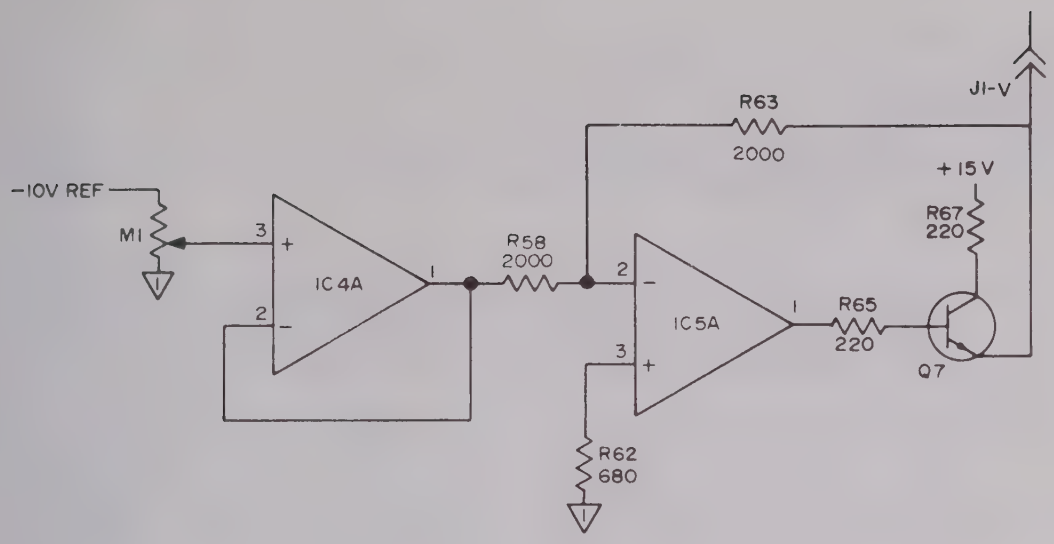

Fig. 8 Sweep amplifier (CW M1 mode), simplified circuit diagram

CW M1 mode

25. As shown by Fig. 8, adjusting the M1 control establishes a d.c. level which is applied to pin 3 of voltage follower IC4A. The buffered output is fed through R58 to a unity gain amplifier consisting of IC5A and Q7 whose output is used to drive the tuning supply regulator. Thus, varying M1 will cause a corresponding change in the output frequency.

Dwell-time and Z-blanking processor

26. The purpose of this section is as follows:

(1) For improved compatibility with network analysers, the pre-sweep dwell-time is increased to 3-4 ms at the fastest sweep speed.

(2) The Z-blanking output pulse, available at the rear panel, is widened to cover the entire period during which forward sweep is not taking place. This facility enables pre-sweep and end-of-sweep transients to be suppressed from the display of some network analysers not equipped with automatic blanking circuits.

(3) For normal swept-frequency display on an oscilloscope, the increased dwell-time may be cancelled by moving a rear-panel switch (SYM MARKERS/DWELL TIME), thus minimizing the brilliance of the oscilloscope spot during pre-sweep dwell time.

Operation with network analysers

27. In order to take advantage of the increased dwell-time and Z-blanking signal, the rear-panel SYM MARKERS/DWELL TIME switch should be set to the RELATIVE/LONG position. Depending upon the type of analyser in use, the blanking output pulse (-5 V) may be connected if so desired. For applications not involving a network analyser, the switch should preferably be set to the CALIBRATED/SHORT position unless relative markers are required during very narrow symmetrical sweep operation, in which case the extra bright

oscilloscope spot must be tolerated.

Circuit operation

28. Increased dwell-time. Referring to Chap. 7 Fig. 4, the sweep generating integrator, IC1A, operates as follows:-

(1) During forward sweep, there is no current in resistor R22; therefore the feedback current through one of the A4A2 capacitors must balance the current in A4R18 derived from a positive potential. Thus, the output voltage of IC1A moves linearly in a negative direction until the bistable circuit of Q3 and Q4 changes state.

(2) When Q3 collector goes negative, the current in R22 (towards that negative potential) is greater than that in A4R18. Consequently, the feedback current through the integrator capacitor must reverse and the output voltage of IC1A returns in a positive direction towards 0 V. The sawtooth waveform generated by IC1A is inverted by IC1B and fed to the clamping comparators of IC2. When, during retrace, the sawtooth reaches 0 V, the output of the "0 V" comparator, IC2A, moves from a positive to a negative voltage as shown in the waveforms of Fig. 10 .

(3) Pin 1 of IC2A is connected via A4J1-7 to A7J1-2 and thence to A6IC1-A the output of which moves abruptly from approximately +13 V to -13 V. The non-inverting input to A6IC1-B is driven via A6C1 from its resting potential, +5 V, to approximately -20 V and recovers with time-constant C1 x R3, resulting in a negative-going output pulse from IC1-B of 2-3 ms duration. This pulse is connected through 47 kΩ resistor A6R5, via A7J1-4 and A4J1-L, to sweep generator A1IC1A. Even though the bistable has removed the negative potential from R22, this new "negative current" is greater than the "positive current" in A4R18 so that a new forward sweep cannot begin until the 2-3 ms has expired. Meanwhile, the output of the integrator is prevented from continuing upwards by feedback through diode A1CR11.

29. Z-Blanking. Any of the negative-going inputs to OR-gate A6CR3-5 causes the output of A6IC2-A to go fully negative. These inputs are:-

(1) the normal r.f. blanking signal during retrace,

(2) the amplified (now stretched) output from the 0 V clamp A1IC2-A, and

(3) the sweep hesitation signal (not yet discussed) from A6IC2-B.

In addition, the short positive-going signal from the 10 V clamp, A1IC2-B, is fed to the inverting input of A6IC2-A with the same effect. Zener diode A6CR6 clamps the resultant pulse to -5 V at the BLANKING OUTPUT socket.

30. Sweep hesitation. Used only during automatic band-switching, this signal, changing from open-circuit (or +15 V) to near 0 V at TB1-5, is fed through A6IC2-B, a voltage follower the output of which normally rests at about +13 V.

31. Upon receipt of a near 0 V hesitation signal at TB1-5, IC2-B output falls to the same level. As this is not always quite 0 V, diode A4CR10 is introduced between IC2-B output and the drive voltage to the sweep generator. This diode is not fitted in the A6 assembly because of the presence of A7R1, off that assembly, explained below. The waveforms in 6700B with A6 assembly in circuit (with switch SYM MARKERS/DWELL TIME to RELATIVE/LONG) are shown in Fig. 10.

32. Operation with A6 assembly removed. Under fault conditions, and particularly during initial testing of a new mainframe, the presence of A6 might lead to confused diagnosis. For this reason, it has been made possible to restore the circuit of the sweep generator to normal (or very nearly so) simply by pulling out A6. A7R1, mounted on the edge-connector, provides the desired continuity from +15 V to the sweep generator, albeit via diode A4CR10.

33. The value of A7R1 is chosen to give approximately 13 V at A7-8 so that sweep speeds are nearly the same as with A6 fitted. In this condition, all waveforms are normal, except that no blanking output signal is present at the rear panel.

34. The waveforms in 6700B with A6 assembly removed or switch SYM MARKERS/ DWELL TIME to CALIBRATED/SHORT are shown Fig. 11.

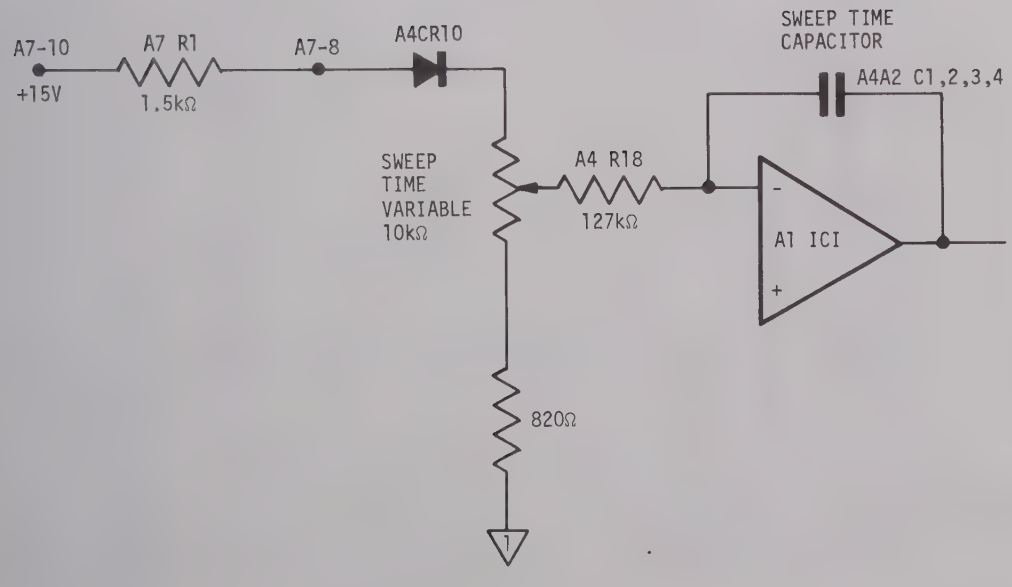

Fig. 9 Continuity circuit with A6 assembly removed

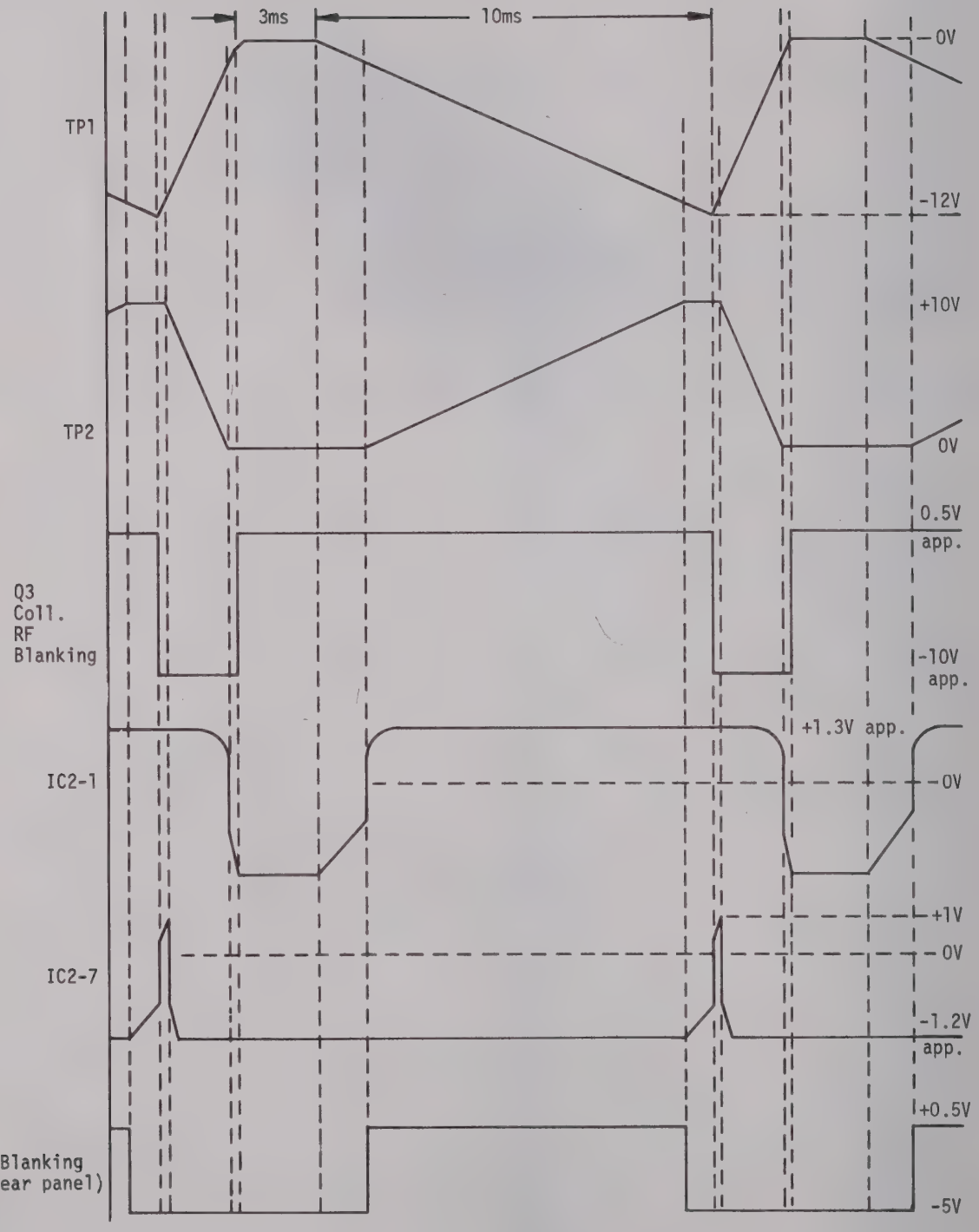

Fig. 10 Waveforms in 6700B with SYM MARKER/DWELL TIME switch to RELATIVE/LONG

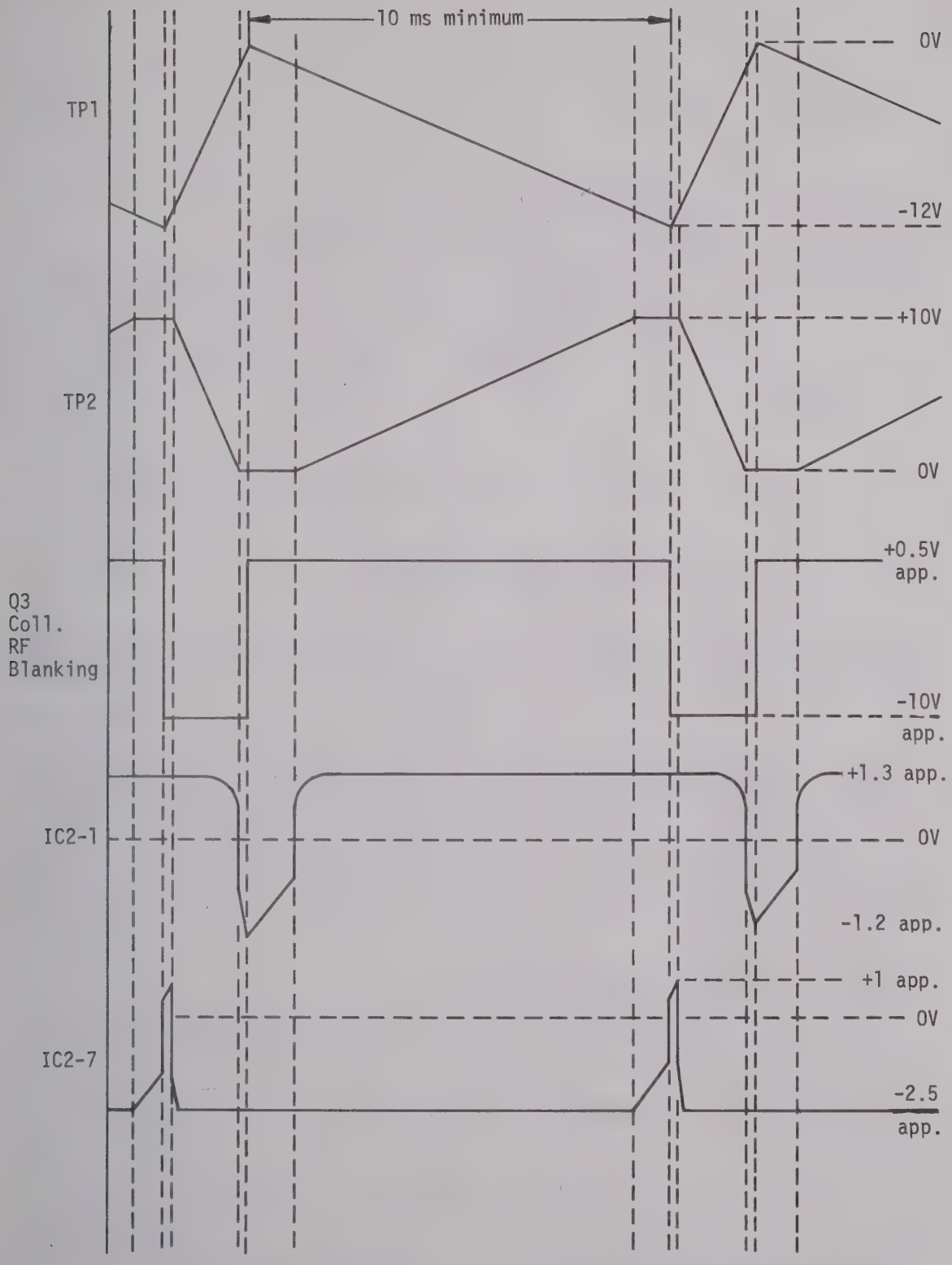

Fig. 11 Waveforms in 6700B with A6 assembly removed or SYM MARKERS/DWELL TIME switch to CALIBRATED/SHORT

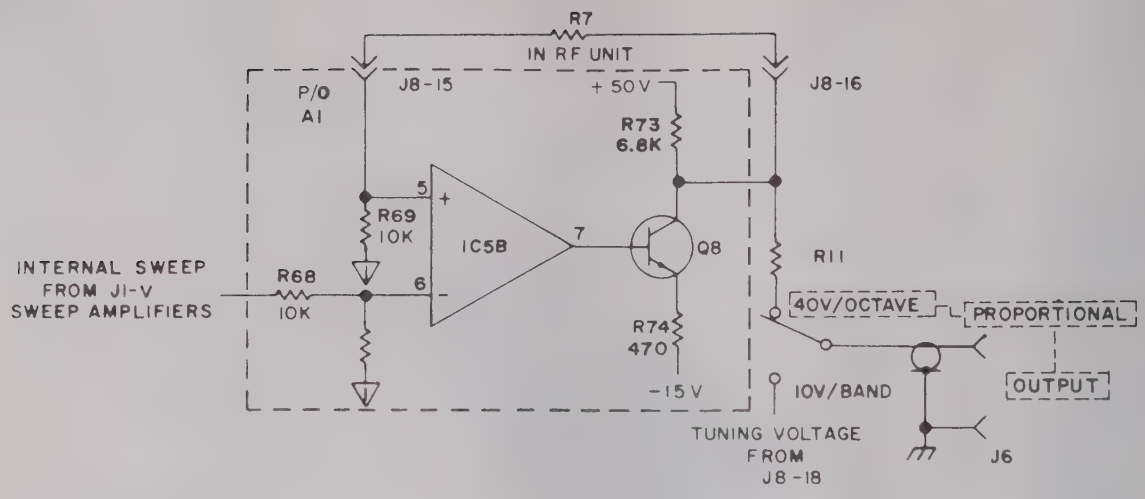

Fig. 12 Proportional sweep amplifier, simplified circuit diagram

Proportional output (sweep and marker generator)

35. As shown in Fig. 12, the proportional output signal available at the rear panel PROPORTIONAL OUTPUT connector is present in all sweep modes. With the PROPORTIONAL OUTPUT switch set to 10 V/BAND the tuning voltage developed in the mainframe is available at the connector.

36. The higher scale factor of 40 V/OCTAVE is obtained from the feedback amplifier consisting of IC5B and Q8. The output from the sweep amplifier is applied via R68 to the inverting input (pin 6) of IC5B. The output on pin 7 is inverted again by Q7 and applied through R11 and the 40 V/OCTAVE switch to PROPORTIONAL OUTPUT connector J6. Gain is determined by the values of R7 (in the r.f. unit) and R69. For a one octave r.f. unit the gain is +4 which means that the proportional output will be zero at the low end and +40 V at the high end of the octave.

Frequency marker (sweep and marker generator)

37. Each marker is generated by comparing a d.c. voltage with a sweeping voltage. When the sweep voltage amplitude coincides with the marker d.c. voltage, a marker waveform is generated. The d.c. voltage is obtained from a front panel marker frequency control potentiometer (M1, M2, F1 or F2) whose setting represents a voltage level corresponding to its marker position on the frequency scale.

38. As shown in Fig. 13, comparison between sweep voltage and the d.c. voltage from the marker control potentiometer is accomplished via equal input resistors to a difference amplifier. Its output is a greatly amplified version of the zero crossing which results when the sweep input amplitude is equal to the marker d.c. voltage. The difference amplifier's direct output and an inverted output are compared by an AND gate which selects the more positive of its inputs, resulting in a triangular output. The apex of this triangle occurs when the value of the sweep signal equals the d.c. level set by the marker potentiometer. The outputs of both marker channels are combined in an OR gate, attenuated by the front panel MARKER AMPLITUDE control, and

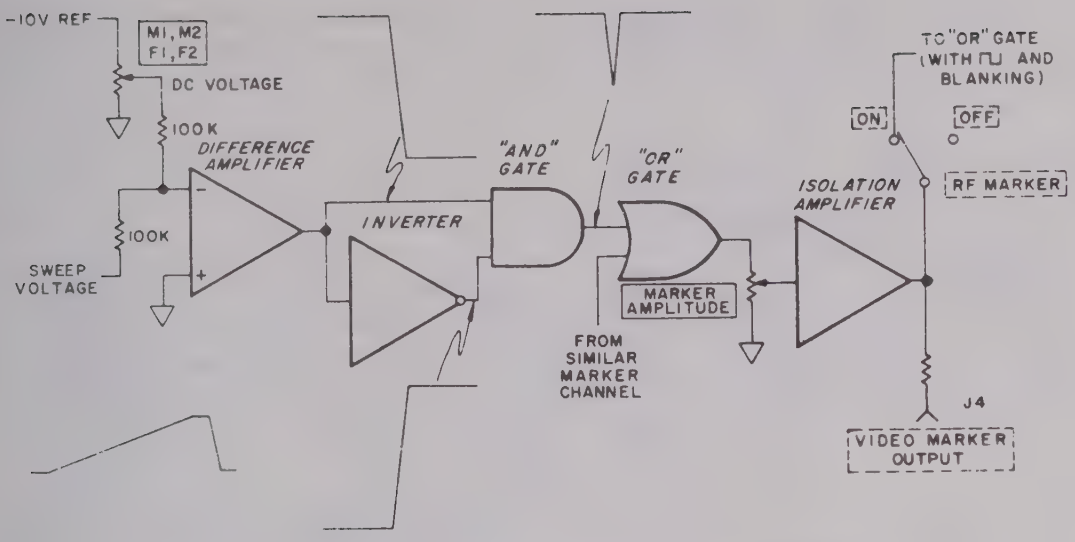

Fig. 13 Frequency marker generation

presented as both video marker output signals and as amplitude dips if the RF MARKER switch is set to ON.

Square wave generator (sweep and marker generator)

39. Internal square wave amplitude modulation is provided by the circuit shown in Fig. 14. Transistors Q15 and Q16 comprise an emitter-coupled free-running multibrator that is activated when the front panel 1 kHz⊓⊔ switch is set to ON. As Q15 goes into saturation, it cuts off Q16 by capacitively driving the emitter of Q16 to a low potential while, at the same time, applying a high reverse potential to its base coupling diode, CR39. After approximately 500 µs, capacitor C23 discharges to the point where Q16 begins to conduct. As a result, transistor Q16 capacitively couples a reduced emitter potential to Q15 causing it to conduct less. As Q15's collector voltage decreases, the base of Q16 is driven more negative, which increases the conduction of Q16 and cuts off Q15. After approximately 500 more µs, C23 charges sufficiently to allow Q15 to begin conducting once again. Regenerative action quickly saturates Q15 which cuts off Q16 and the cycle continues.

40. The square wave output is combined with the blanking signal from the sawtooth generator and with r.f. markers to modulate the r.f. output via the r.f. unit's leveller section. Frequency of the 1 kHz generator may be varied by using the front panel 1 kHz⊓⊔ screwdriver adjustment.

Power supplies

41. When primary power is applied to the type 6700B, the neon indicator above the switch becomes illuminated to verify operation. As shown in Chap. 7 Fig. 2, the +50 V, bias, varactor and YIG supplies have their rectifiers and filters located on the A4 assembly. The ±15 V and +5 V rectifiers and filters, with their respective regulators, are located on the A2 assembly. Also located on the A2 assembly is the -10 V supply which is referenced to the +15 V source.

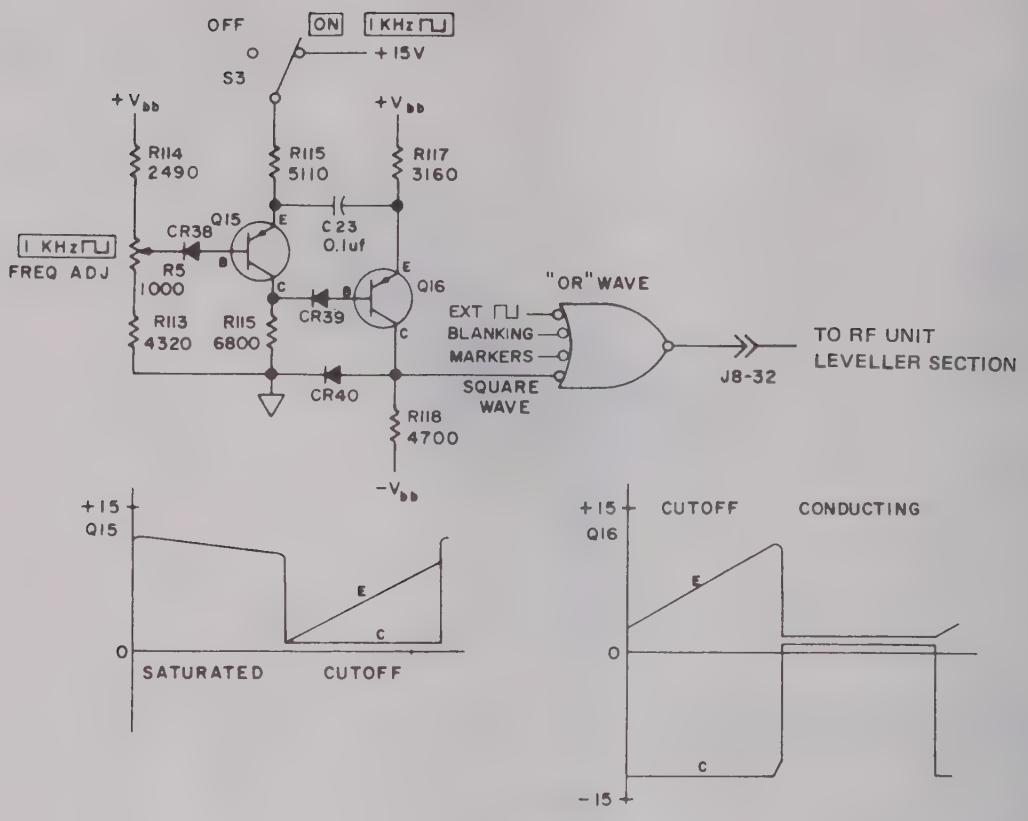

Fig. 14 Square wave generation

±15 and -10 V supplies

42. Each regulated supply consists of a d.c. source, a series control transistor and an amplifier which compares the regulated output voltage with a reference voltage. As indicated in Fig. 15, the +15 V supply uses zener diode A2CR5 to establish the reference voltage. The +15 V supply in turn serves as the reference voltage for both the -10 V and -15 V supplies. The -15 V supply is also used as the current source for the -10 V supply. An unregulated +50 V is derived from the same T1 secondary winding as is used for the ± 15 V supplies. Its rectifier and filter are located on the A4 assembly.

+5 V supply

43. The +5 V supply receives its input voltage from a separate winding on T1. The a.c. voltage is rectified by A2CR10 and filtered by A2C25 before being applied to reference amplifier A2IC2B. Silicon controlled rectifier A2Q12, and its associated circuitry, provides over-voltage protection for circuits which use the +5 V supply.

Bias supply and tuning supply

44. The bias supply and tuning supply, respectively, supply the bias voltage and the unregulated d.c. for YIG tuned r.f. oscillators located in most of the r.f. units. Operation of the r.f. oscillator is covered in the r.f. unit instruction manual.

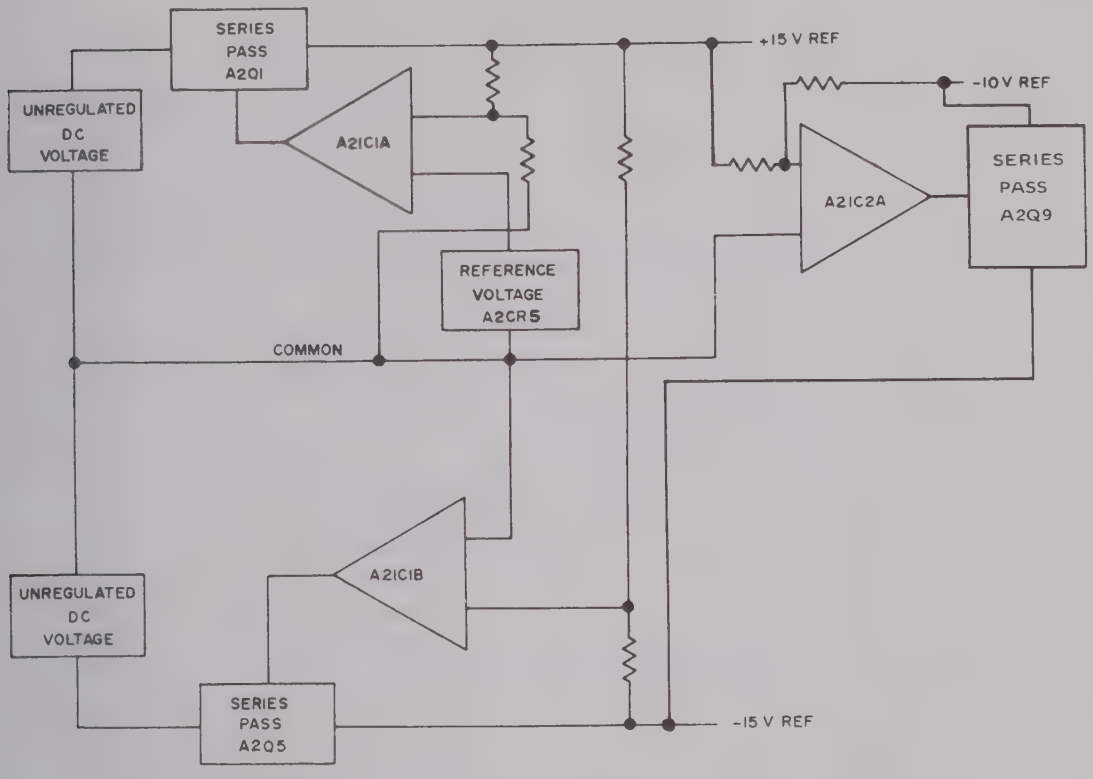

Fig. 15 ±15 V and -10 V power supply block diagram

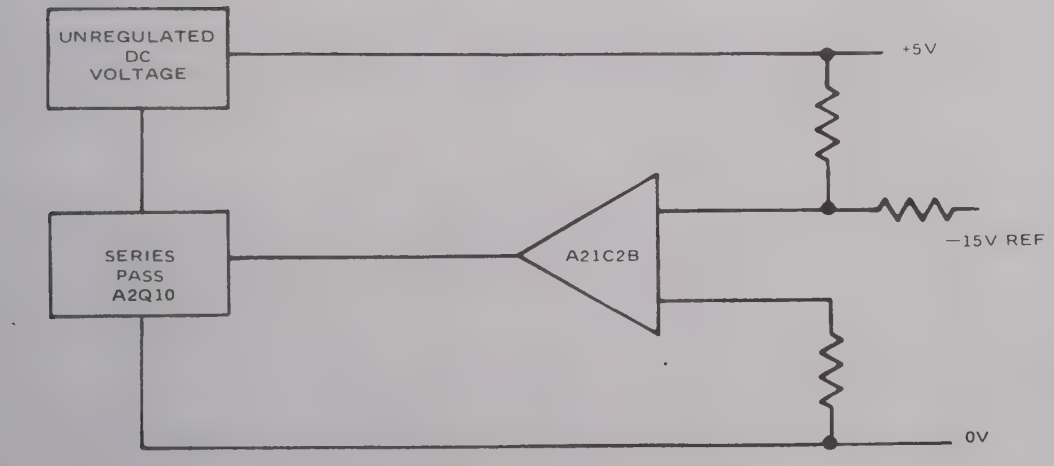

Fig. 16 +5 V power supply block diagram

Chapter 5

MAINTENANCE

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4 Frequency accuracy
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INTRODUCTION

1. This chapter provides the information required to maintain and service the type 6700B Sweep Oscillator (mainframe) and contains a list of the required test equipment, a performance check, calibration and alignment procedures, and a replaceable parts list.

REQUIRED TEST EQUIPMENT

2. Test equipment, other than those items listed in Table 1, may be used if its specifications equal or exceed the required characteristics. The equipment required to perform the calibration is listed in Table 2.

Note...

Use only recently calibrated test equipment.

PERFORMANCE TESTS

3. The following performance tests are performed to verify whether the type 6700B is operating within its specifications as listed in Chap. 1. The tests should be used as part of the incoming quality control inspection, as a periodic operational check, or after maintenance and service has been performed.

Note...

An r.f. unit must be installed in the mainframe before starting the following performance tests.

Frequency accuracy

4. (1) Connect equipment as shown in Fig. 1.

(2) Set type 6700B controls as follows:

Front panel

TRIGGER	Line
MARKER AMPLITUDE	Clockwise
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
F1	Low limit
F2	High limit
1 kHz ⊓⊔	Off (down)
POWER	On

Rear Panel

SWEEP RESPONSE TIME	AUTO
RF MARKERS	ON

(3) Check that the cooling fan on the rear of the mainframe is operating.

RF unit

RF	ON
If the r.f. unit has Option-1 (internal levelling) set:	
LEVELLER MODE	INT (depress)
RF LEVEL	Adjust anti-clockwise until levelling is obtained across the entire band
If the r.f. unit does not have Option-1 set:	
LEVELLER MODE	OFF (depress)
RF LEVEL	Fully clockwise

(4) Set the M1 and M2 indicators at the frequencies to be checked and adjust the MARKER AMPLITUDE as desired.

(5) Tune the frequency meter to make its dip coincide with each marker dip in turn.

(6) Observe that the frequency indicator and the frequency meter indications fall within frequency accuracy limits of the r.f. unit specifications.

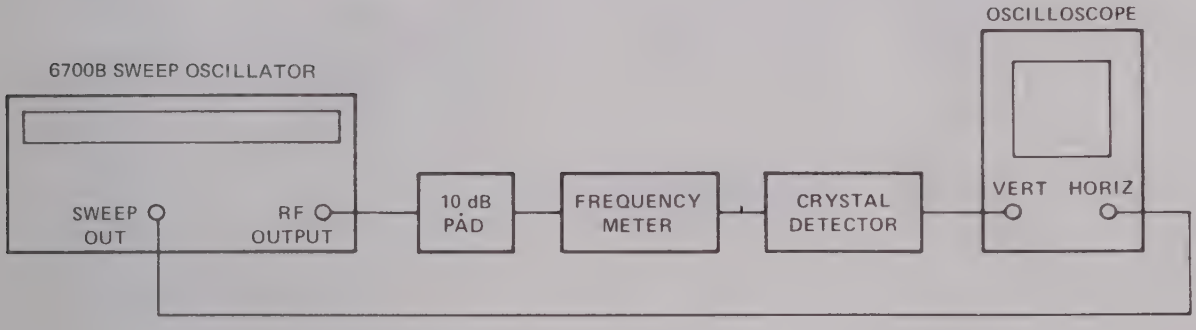

Fig. 1 Frequency accuracy measurement test set-up

Power output (unlevelled)

5. (1) Connect the power meter to the RF OUTPUT connector through a 10 dB pad. Do not use intervening cabling.

(2) Set type 6700B controls as follows:

SWEEP FUNCTION	CW M1
1 kHz⊓⊔	Off (down)
RF LEVEL	Fully clockwise
LEVELLER MODE	OFF

(3) Adjust the M1 control across the band, and note the minimum output power level indicated on the power meter.

TABLE 1 REQUIRED TEST EQUIPMENT FOR PERFORMANCE TESTS

Title	*Requirements*	*Suggested manufacturer and model no.*
Variable transformer	At least 105 to 250 V a.c. 2 A	Zenith "Variac", Model V3-G2
AC voltmeter	At least 105-250 V a.c. ±2½% 48-62 Hz	Salford Electrical, Selectest-Super 50
Oscilloscope	Vertical: d.c. to at least 300 kHz	Tektronix 561A with 2A63 Differential Amp 1 and 2B67 Time Base
Frequency meter, reaction type		
200-500 MHz	±0.1% accuracy	Narda 804
500-1000 MHz	±0.1% accuracy	Narda 805
1-2 GHz	±0.1% accuracy	H-P Model 536A
1-4 GHz	±0.1% accuracy	H-P Model 536A
2.6-8.2 GHz	±0.1% accuracy	MI/Sanders 6049/1
5.3-18 GHz	±0.1% accuracy	MI/Sanders 6049/2
10 dB attenuator pad	Calibrated within ±0.1 dB	MI/Sanders 6534/3
RF power meter with thermistor mount		
0.2 to 8.2 GHz	±0.3 dB	HP 432A with HP 478A
8.2 to 12.4 GHz		HP X486A with coaxial to waveguide adapter
12.4 to 18 GHz		HP P486A with coaxial to waveguide adapter
Directional coupler	10 dB coupling factor	
30 to 1000 MHz	20 dB directivity	Anzac DCG10
500 to 1000 MHz		Weinschel Model 1540
1-2 GHz		Weinschel Model 1541
2-4 GHz		Weinschel Model 1542
4-8 GHz		Weinschel Model 1543
8-12.4 GHz		Weinschel Model 1544
12.4-18 GHz	15 dB directivity	Narda Model 4016-10
Pulse generator	±10 V, less than 1 µs rise time, 10 to 1000 Hz	Marconi Instruments TF 2010
Ohmmeter	DC continuity	Salford Electrical, Selectest Super 50
Crystal detector	400 MHz - 18 GHz	MI/Sanders 6160

TABLE 2 REQUIRED TEST EQUIPMENT FOR CALIBRATION PROCEDURES

Title	*Requirements*	*Suggested manufacturer and model no.*
Precision d.c. digital voltmeter	±0.01% accuracy, 400 kΩ minimum resistance, 1 mV sensitivity	Dana Series 4400

Note...

Power meter and pad calibration factors must be taken into account when checking the power output level.

(4) The minimum power indication should be equal to or higher than the minimum power output level (mW) as specified in the r.f. unit specifications*.

Power variation (levelled)

6. Internal levelling

(1) Connect a power meter to the RF OUTPUT connector through a 10 dB pad. Do not use intervening cable.

(2) Set type 6700B controls as follows:

MARKER AMPLITUDE	Fully anti-clockwise
SWEEP FUNCTION	F1-F2
SWEEP TIME	MAN
F1	Low end of band
F2	High end of band
1 kHz⊓⊔	Off (down)
LEVELLER MODE	INT

(3) Simultaneously adjust the RF LEVEL control anti-clockwise just enough to keep the UNLEVELLED indicator extinguished while rotating the SWEEP TIME (SEC) VARIABLE control through its entire range and note maximum and minimum power levels (dB), as indicated on the power meter.

(4) The total power variation observed in step (3), should not exceed the total variation specified for the r.f. unit. The pad calibration factor must be taken into account.

7. External levelling

(1) Connect equipment as shown in Fig. 2.

(2) Set type 6700B controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.01
F1	Low end of band
F2	High end of band
1 kHz⊓⊔	Off (down)
SWEEP RESPONSE TIME	AUTO
LEVELLER MODE	XTAL EXT†

*RF units with Option-1 (internal levelling), have a slightly lower minimum output level than those units which do not include the option.

†XTAL/PWR MTR slide switch is located on top left hand side of r.f. unit, near the front panel.

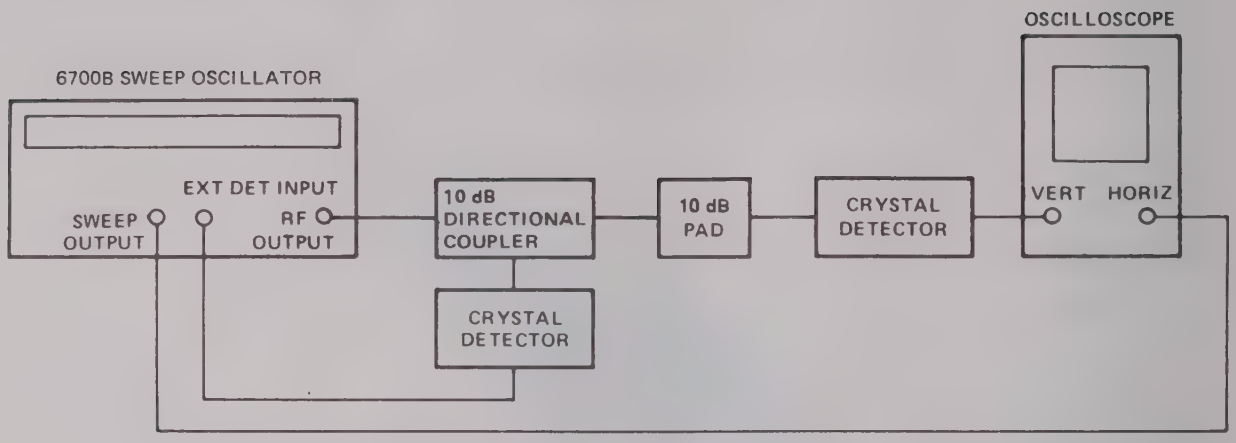

Fig. 2 External levelling measurement test set-up

(3) Adjust the RF LEVEL control over its range and then rotate it anti-clockwise just enough to obtain levelling across the entire band making sure that the UNLEVELLED indicator remains extinguished.

(4) Replace the oscilloscope and crystal detector with an r.f. power meter as shown in Fig. 3.

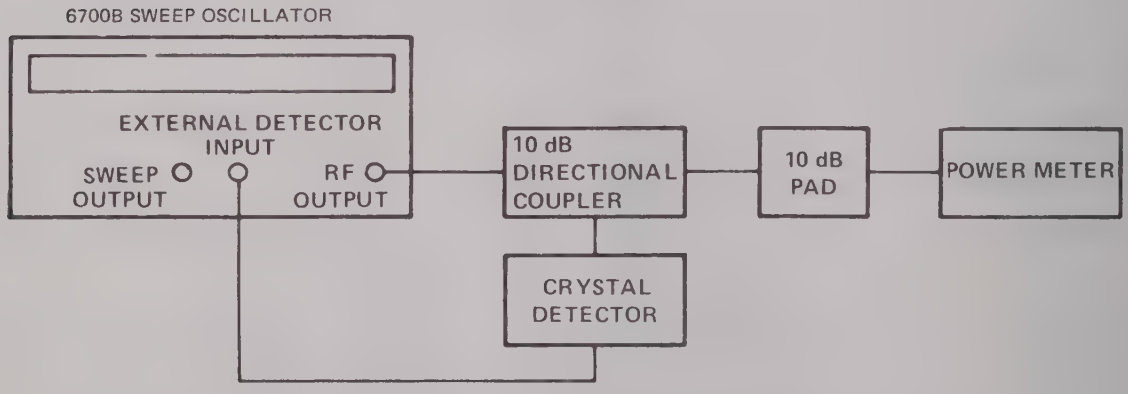

Fig. 3 External levelling measurement test set-up (2)

(5) Set the SWEEP TIME control to MAN.

(6) Rotate the VARIABLE SWEEP TIME control through its entire range and note the maximum and minimum power meter indications (dB).

(7) The total power variation observed in step (6) should not exceed the total variation specified for the r.f. unit. The effect of the external crystal detector in addition to the 10 dB pad must be taken into account.

8. Power meter levelling

(1) Connect equipment as shown in Fig. 3 with the following exceptions: substitute a power meter (HP model 432A recommended) for the crystal detector and connect the d.c. output (recorder output) to the EXT DET INPUT on the type 6700B. Set power meter to 3 mW range.

(2) Set type 6700B controls as follows:

MARKER AMPLITUDE	Fully anti-clockwise
SWEEP FUNCTION	F1-F2
SWEEP TIME	MAN
F1	Low end of band
F2	High end of band
1 kHz ⊓⊔	Off (down)
LEVELLER MODE	EXT with XTAL/PWR, MTR slide switch set to PWR MTR

(3) Adjust the RF LEVEL control over its range and then rotate it anti-clockwise just enough to obtain levelling across the entire band making sure that the UNLEVELLED indicator remains extinguished. Change power meter range to 1 mW if desired and adjust GAIN control on r.f. unit front panel if instability occurs.

(4) Rotate the VARIABLE SWEEP TIME control through its entire range and note the maximum and minimum power meter indications (dB).

(5) Maximum power variation should be less than ±0.1 dB.

(6) Re-position the XTAL/PWR, MTR, switch to its XTAL setting.

Sweep trigger

9. Automatic

(1) Connect equipment as shown in Fig. 1 except that the frequency meter may be omitted and the 10 dB pad is connected direct to the crystal detector.

(2) Set type 6700B controls as follows:

TRIGGER	AUTO
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1

(3) Observe that the sweep is present on the oscilloscope and that the SWEEP ON indicator is illuminated during forward trace.

10. Line trigger

(1) Repeat para.9 except set TRIGGER selector to LINE position.

11. Single sweep

(1) Repeat para.9 except set TRIGGER selector to SINGLE SWEEP position and press the adjacent push-button switch. The sweep should occur once for each time the push-button is pressed.

Note...

Do not apply external trigger input signals when using the single sweep mode.

12. External trigger

(1) Repeat para.9 except set TRIGGER selector to EXT position.

(2) Apply any convenient trigger waveform (~~sine, square, or ramp~~ −10V Pulse) to the EXT ~~SYNC~~ TRIGGER INPUT located on the rear panel. Duration of the input pulse must be a minimum of 1 µs with any repetition rate between 1 and 100 Hz. Increase amplitude of the input level until a reliable sweep generation is established.

Note...

Amplitude of the external trigger input signal should not exceed −10 V.

Internal square wave

13. Unlevelled

(1) Connect equipment as shown in Fig. 1 except that the frequency meter may be omitted and the 10 dB pad is connected direct to the crystal detector. Also, remove the cable between the SWEEP OUTPUT on the type 6700B and the horizontal input on the oscilloscope. Set Sweep Function to CW M1 with M1 at mid-scale.

Note...

The output of the crystal detector (connected to the oscilloscope) should be shunted by a resistor of approximately 600 Ω to reduce the time constant of the crystal detector.

(2) Set type 6700B controls as follows:

1 kHz ⊓⊔	ON
RF LEVEL	Fully clockwise
LEVELLER MODE	OFF

(3) Using the oscilloscope time base, measure square wave rise time, fall time and period. Both rise and fall times should be 10 µs maximum. The period should be adjustable from less than 950 to more than 1050 µs.

14. Levelled

(1) If the r.f. unit has Option-1, use the same equipment set-up as used in para.13 and set the type 6700B controls as follows:

LEVELLER MODE	INT
1 kHz ⊓⊔	ON
RF LEVEL	Rotate anti-clockwise until UNLEVELLED indicator just goes out.

(2) If the r.f. unit does not have Option-1, set the controls as described in step (1), except that the LEVELLER MODE must be set to XTAL EXT.

(3) Connect equipment as shown in Fig. 2.

(4) Using the oscilloscope time base, measure both rise and fall time and symmetry. Rise and fall time should each be 10 µs maximum; symmetry within 60:40.

External a.m.

15. (1) Connect equipment as shown in Fig. 2.

(2) Set type 6700B controls as follows:

1 kHz ⊓⊔	Off (down)
RF LEVEL	Mid range (approximate)
LEVELLER MODE	OFF

(3) Connect the output from a square wave generator to the rear panel AM INPUT. Adjust amplitude so that a further increase does not increase the r.f. amplitude. A positive voltage increases the output power if the RF LEVEL control is not fully anti-clockwise, while a negative voltage decreases the output power.

(4) Rise and fall time should not exceed 1 µs, maximum amplitude into the AM INPUT connector should not exceed either +10 or -10 V.

(5) Set type 6700B controls as follows:

LEVELLER MODE	INT
1 kHz ⊓⊔	Off (down)
RF LEVEL	Approx. 20%

(6) Repeat step (3) and check that rise and fall times do not exceed 2 µs.

Symmetrical sweep width accuracy

16. (1) Connect equipment as shown in Fig. 1.

(2) Set type 6700B controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	SYM M1
SWEEP TIME (SEC)	.1
M1	Centre of band
RF LEVEL	Fully clockwise
LEVELLER MODE	OFF
SWEEP RESPONSE TIME	AUTO

(3) At each setting of the SYMMETRICAL SWEEP WIDTH control to be checked (depending on r.f. unit) tune the frequency meter to both the high and the low end of the frequency range being swept and note the two different frequency readings.

(4) The difference between the two frequency meter readings and the corresponding frequency limits of the calibrated settings of the SYMMETRICAL SWEEP WIDTH control should be within ±3% for YIG tuned r.f. units and ±10% for varactor tuned r.f. units.

Residual f.m.

17. (1) Connect RF OUTPUT via a 10 dB pad and coaxial cable to a spectrum analyser.

(2) Set controls as specified in para.16 (2), except that TRIGGER should be moved to EXT and SYM SWEEP WIDTH to minimum.

(3) Locate and identify the M1 signal on the spectrum analyser and progressively decrease scan width, bandwidth, and time-base speed until a display similar to Fig. 4 is obtained with bandwidth as small as is practicable.

(4) Divide the peak-to-peak residual f.m. observed by 2 to obtain peak residual f.m. This should not exceed the specification for the r.f. unit being used.

Note...

To ensure that the auto bandwidth circuitry is functioning properly, move the SWEEP RESPONSE TIME slide switch (on rear panel) to FAST. The residual f.m. should increase considerably. Then set the switch back to AUTO. Within a few seconds, the residual f.m. should decrease to its minimum value indicating that the bandwidth has been reduced.

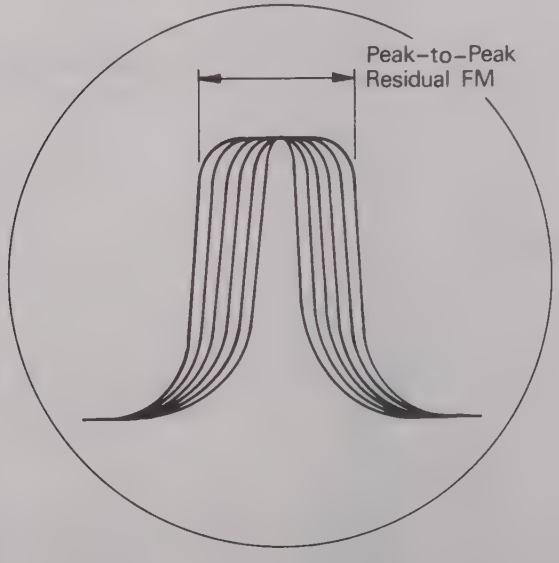

Fig. 4 Spectrum analyser display

(5) Repeat the measurement with M1 set to the nominal low end of band and the nominal high end of band.

Blanking output

18. (1) Connect the rear panel BLANKING OUTPUT to the oscilloscope vertical input.

(2) Set type 6700B controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	0.1

(3) Output should be -5 V (coincident with sweep retrace).

Marker video output

19. (1) Connect the rear panel MARKER OUTPUT to the oscilloscope vertical input.

(2) Set type 6700B controls as follows:

MARKER AMPLITUDE	Fully clockwise
TRIGGER	LINE
SWEEP FUNCTION	F1-F2
F1	Low end of band
F2	High end of band
M1 and M2	Within band
SWEEP TIME (SEC)	.1

(3) Output should be at least -5 V.

Pen lift

20. (1) Connect an ohmmeter to the rear panel PEN LIFT TERMINALS.

(2) Set type 6700B controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	10

(3) Ohmmeter should indicate continuity during forward trace; open during retrace.

Proportional sweep amplitude

21. (1) Connect the PROPORTIONAL OUTPUT to the oscilloscope vertical input.

(2) Set type 6700B controls as follows:

TRIGGER	LINE
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	0.1
F1	Lower limit
F2	Upper limit
PROPORTIONAL	10 V/BAND

(3) The PROPORTIONAL OUTPUT voltage should start at +0.25 (±0.25) V and finish at +9.75 (±0.25) V.

(4) Set the rear panel PROPORTIONAL switch to 40 V/OCTAVE.

(5) The PROPORTIONAL OUTPUT voltage should now start at +1 (±1) V and finish at +40 (±3) V for an octave band r.f. unit.

Dwell time and Z-blanking processor - Assembly A6

22. (1) Connect oscilloscope to blanking output (rear panel) and use internal time-base at 5 ms/cm. Set vertical sensitivity to 2 V/cm.

(2) Set controls as follows:

(i) Front panel:-

F1, M1	Fully anti-clockwise
F2, M2	Fully clockwise
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	0.01
Variable	Fully clockwise
TRIGGER	AUTO
MARKER AMPLITUDE	Anti-clockwise
1 kHz ⊓⊔	OFF

(ii) Rear panel:-

SWEEP RESPONSE TIME	AUTO
RF DURING RETRACE	OFF
DISPLAY SWEEP AMPLITUDE	Fully clockwise (max)
MARKERS	ON
PROPORTIONAL REFERENCE	10 V/BAND
SYM MARKERS/DWELL TIME	RELATIVE/LONG

(3) Apply mains power and examine the oscilloscope picture. The width of the Z-blanking pulse presented should be 6-8 ms. Pulse amplitude should be 4.8 - 5.4 V, negative-going from a base level at about +0.7 V.

(4) Transfer oscilloscope lead to view DISPLAY SWEEP OUTPUT and check the durations of the sweep, dwell and retrace sections as follows:

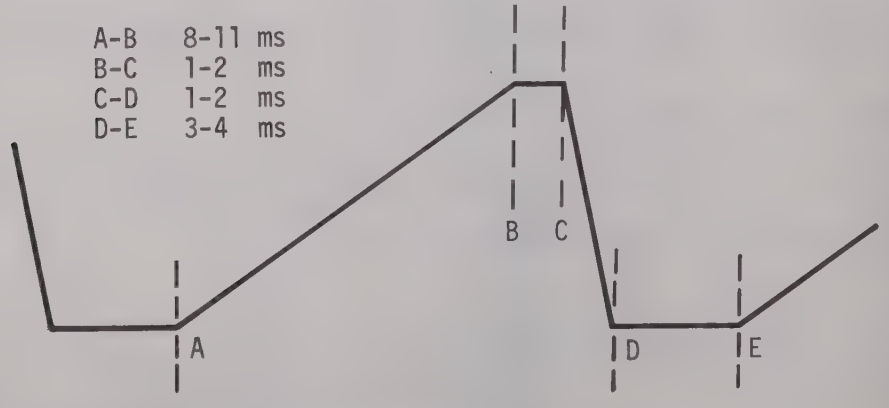

Fig. 5 Durations of sweep dwell and retrace periods

Move SYM MARKERS/DWELL TIME switch to CALIBRATED/SHORT. D-E should reduce to 1-2 ms. Return switch to RELATIVE/LONG.

(5) Switch to LINE TRIGGER and verify that the sweep circuit runs at every cycle of mains frequency (not every other cycle with D-E extended to over 20 ms). It should be possible to turn the SWEEP TIME VARIABLE control at least 10% anti-clockwise from the fully clockwise position before the circuit becomes unable to respond to every cycle of mains.

Sweep hesitation input

23. (1) While still viewing the DISPLAY SWEEP OUTPUT, momentarily short TB1-5 (rear panel) to earth. The sweep should stop as long as the short is maintained.

(2) Reduce sweep speed to 10 s per sweep and connect DISPLAY SWEEP OUTPUT to oscilloscope external horizontal input. Set oscilloscope controls to produce a horizontal line about 10 cm long.

(3) When oscilloscope spot reaches about half-way, short TB1-5 to ground for about 1 s. The spot should cease moving while the short is maintained and then resume its motion upon removal of the short.

CALIBRATION PROCEDURES

Reference power supplies

Note...

The following measurements of power supply outputs should be made with a precision d.c. digital voltmeter.

24. (1) Remove the r.f. unit from the mainframe.

(2) Connect a jumper lead of insulated 16/0.2 mm wire, about 25 cm long, between A1TP12 (see Chap. 7 Fig. 3) and chassis ground at the top of the bracket which supports the r.f. unit connector.

(3) Set mainframe controls as follows:-

F1, M1, M2, F2	Nominal low end of scale
SWEEP TIME (SECS)	0.1
Variable	Fully clockwise
1 kHz⊓⊔	OFF
TRIGGER	EXT
SWEEP FUNCTION	CW M1

(4) Connect the digital voltmeter (DVM) between A1TP12 (ground) and A5TP3 (see Fig. 7).

(5) Switch on, observe that the DVM reads approximately -10 V, and allow 30 min for thorough warming up before proceeding with calibration.

(6) Adjust A2R10 for a DVM reading of -10.000 (±0.001) V.

(7) Turn SWEEP FUNCTION selector to F1-F2.

(8) Connect a short jumper lead between A1TP2 and A1TP12.

(9) Adjust A1R51 until the DVM, still connected between A1TP12 and A5TP3, reads -10.000 (±0.001) V.

(10) Remove the jumper between A1TP2 and A1TP12, but leave the other one, between ATP12 and ground, in place.

(11) Connect DVM between A1TP12 (ground) and A2TP1. The meter should read -15.000 (±0.020) V.

(12) Connect DVM between A1TP12 (ground) and A2TP3. The meter should read +15.000 (±0.020) V.

(13) Connect DVM between A1TP12 (ground) and A2TP4. The meter should read +5.0 (±0.3) V.

Dial mechanism calibration

25. (1) Set F1, M1, M2 and F2 indicators exactly at the nominal low end of the frequency scale as illustrated in Fig. 6.

(2) Set SWEEP FUNCTION selector to F1-F2, leaving TRIGGER selector at EXT.

(3) M1 Low adjustment *connect DVM between A1TP12 (ground) and A5TP5 and adjust A5R6 for -0.328 (±0.005) V.

* SET M1 TO NOMINAL LOW END AND

(4) M1 High adjustment - set M1 exactly to the nominal high end of the frequency scale and adjust A5R5 for -9.672 (±0.005) V.

5 RELEAM 3&4 SCANNER TUNE UNTIL CORRECT

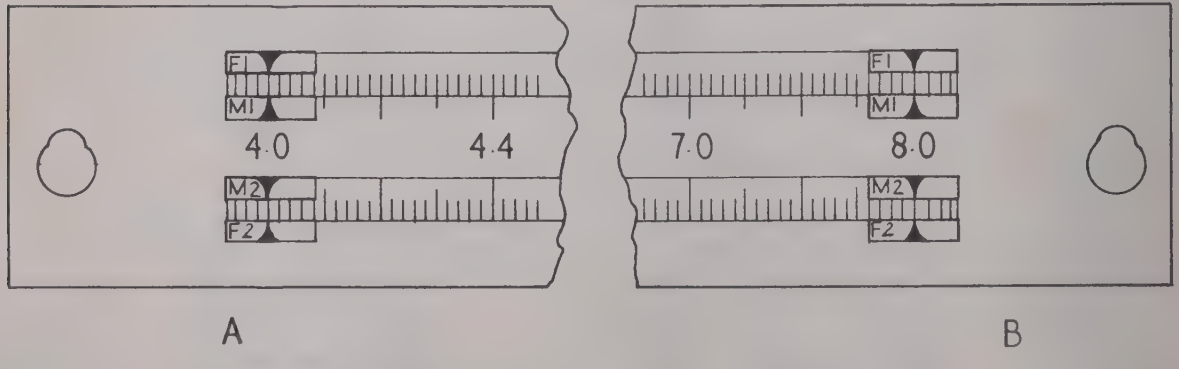

Fig. 6 Dial mechanism calibration settings. (Nominal 4.0-8.0 GHz scale illustrated with pointers set to either 4.00 GHz or 8.00 GHz)

(5) ~~Set M1 to nominal low end of scale and repeat (3) if necessary.~~

(6) M2 Low adjustment - connect DVM between A1TP12 and A5TP6 and adjust A5R3 for -0.328 (±0.005) V.

(7) M2 High adjustment - set M2 exactly to the nominal high end of the scale and adjust A5R4 for -9.672 (±0.005) V.

(8) Set M2 to nominal low end of scale and repeat (6), ~~if necessary~~.

(9) F1 Low adjustment - connect DVM between A1TP12 and A5TP4. Set SWEEP FUNCTION to M1-M2 and adjust A5R7 for -0.328 (±0.005) V.

(10) F1 High adjustment - set F1 exactly to the nominal high end of the scale and adjust A5R8 for -9.672 (±0.005) V.

(11) Set F1 to nominal low end of scale and repeat (9) ~~if necessary~~.

(12) F2 Low adjustment - connect DVM between A1TP12 and A5TP7 and adjust A5R2 for -0.328 (±0.005) V.

(13) F2 High adjustment - set F2 to nominal high end of scale and adjust A5R1 for -9.672 (±0.005) V.

(14) Set F2 to nominal low end of scale and repeat (12) if necessary.

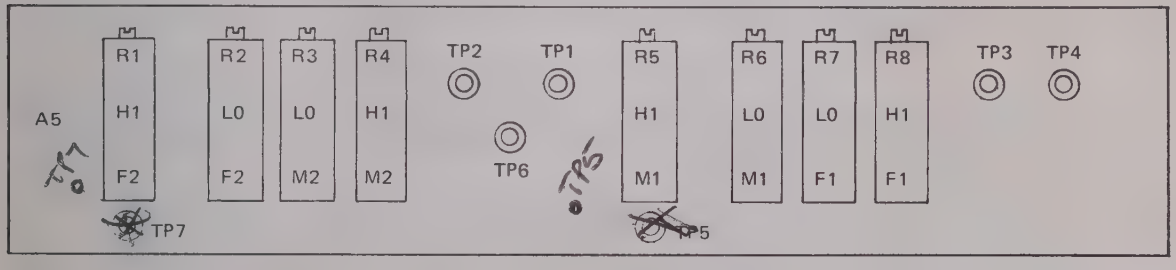

Fig. 7 Test point and adjustment locations, Assembly A5

Remote digital frequency programming (Option-01) - Installation and adjustment

26. (1) Fit a remote digital frequency programming board (A3) into mainframe jack J3 (see Chap. 7 Fig. 1) and perform the following wiring changes before proceeding to step (2).

After installing an A3 board, remove the six quick-disconnect wires from TB2 and reconnect them to quick-disconnect pins 1 to 6 on the rear of the A3 board. Three of these wires come from the underside of TB2 and three come from a wiring harness. Connect these wires to the six quick disconnect pins on the A3 board as indicated in the following sketch:

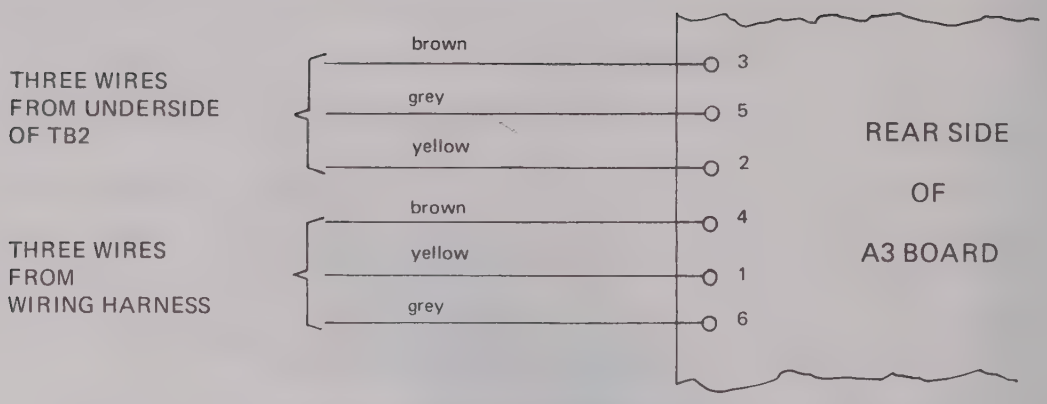

Fig. 8 Connections for adjustment of A3 board

Remove the jumper from between terminals 1 and 2 on TB1 (rear panel of mainframe). This is marked: "FOR OPTION 01 REMOVE JUMPER".

(2) Set controls as follows:

TRIGGER	EXT
MARKER AMPLITUDE	Fully clockwise
SWEEP FUNCTION	EXT/M1
SWEEP TIME (SEC)	MAN
1 kHz⊓⊔	OFF

(3) Apply decimal 000 (BCD 0000-0000-0000) logic level "0's" to pins as indicated on the 36 pin REMOTE PROGRAMMING INPUT CONNECTOR (J12) located on the rear panel.

J12 pins	31	30	32	34	X	27	26	28	29	X	23	22	24	25
BCD bits	D3	C3	B3	A3	X	D2	C2	B2	A2	X	D1	C1	B1	A1

most significant BCD digit — least significant BCD digit

(4) Enter the BCD input into the latches by applying a logic "0" (ground) to J12, pin 21 (remote enable) and a logic "1" (+5 V or an open circuit) to J12, pin 20 (strobe).

(5) Connect a precision voltmeter between A3TP1 (A/D converter output) and A3TP2 (analogue ground) and adjust A3R2 to obtain an indication of 0.000 (±0.001) V. (Looking at the component side of the A3 board, A3TP1 is a quick-disconnect pin located to the immediate left of A3R1).

(6) Apply decimal 967 (BCD 1001-0110-0111) to J12 connector pins (refer to step 3) and adjust A3R1 to obtain a voltmeter indication of 9.670 (±0.001) V between A1TP12 (ground) and A1TP15 (see Chap. 7 Fig. 1).

(7) Apply decimal 033 (BCD 0000-0011-0011) to J12 connector pins. Keep the voltmeter leads between A1TP12 and A1TP15 and adjust A3R3 to obtain an indication of 0.330 (±0.001) V.

(8) Repeat (6) and (7) several times until the required accuracy of setting is obtained. A3R1 and A3R3 are slightly interdependent.

(9) Calibration of the A3 board is now completed.

(10) Disconnect all inputs to J12.

ALIGNMENT PROCEDURES

Waveform generator alignment

27. (1) The jumper between A1TP12 and chassis ground should still be connected.

(2) Set M2 and F2 at their upper mechanical stops.

(3) Set M1 and F1 at the nominal high end of the scale.

(4) Connect precision voltmeter between A1TP12 (ground) and A5TP5.

(5) Set SWEEP FUNCTION to CW M1 and record meter reading.

(6) Connect voltmeter between A1TP12 and A1TP15 and adjust A1R61 for exactly the same reading as in (5) but of opposite polarity.

(7) Connect voltmeter between A1TP12 and A5TP5.

(8) Set SWEEP FUNCTION to M1-M2 and record meter reading.

(9) Connect voltmeter between A1TP12 and A1TP15 and adjust A1R55 for exactly the same reading as in (8) but of opposite polarity.

(10) Repeat (4) to (9) until correct agreements are obtained within ±0.002 V.

(11) Leaving F2 and M2 at their upper mechanical stops, set F1 and M1 exactly at the nominal low end of the scale.

(12) Connect voltmeter between A1TP12 and A1TP15.

(13) Set SWEEP FUNCTION to CW M1, M1-M2, and F1-F2 positions, recording each reading in turn. All readings should be 0.328 (±0.005) V. In addition, CW M1 and M1-M2 readings should be within ±0.002 V of each other.

Marker alignment

28. (1) Connect the SWEEP OUT to the oscilloscope horizontal input.

(2) Connect the rear panel MARKER VIDEO OUTPUT to the oscilloscope vertical input.

(3) Set type 6700B controls as follows:

MARKER AMPLITUDE	Clockwise
SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
TRIGGER	AUTO
M1	Exactly mid-band
F2	One scale division higher than M1 setting
F1	One scale division lower than M1 setting
M2	Fully clockwise

(4) Adjust A1R94 so that the M1 marker appears at the centre of the oscilloscope display.

(5) Rotate M1 fully clockwise and position the M2 marker to exactly mid-band.

(6) Adjust A1R92 so that the M2 marker appears at the centre of the oscilloscope display.

(7) Using the calibrated oscilloscope display, check that the amplitude of both markers is a minimum of -5 V.

Internal square wave alignment

29. (1) Set type 6700B controls as follows:

SWEEP FUNCTION	F1-F2
SWEEP TIME (SEC)	.1
1 kHz⎍⎍	ON

(2) Connect the oscilloscope vertical input to A1TP16 and chassis ground.

(3) Using the oscilloscope time base, measure the rise and fall time of the 1 kHz square wave. Both rise and fall time should not exceed 10 µs.

(4) Front panel screwdriver adjustment R5 varies the 1 kHz period from below 950 to above 1050 µs. While observing the oscilloscope, adjust the period for 1000 µs (1 ms).

(5) Amplitude of the square wave as indicated on the oscilloscope should be 12 (±3) V peak-to-peak.

SERVICING

30. Removing the top cover of the mainframe provides access to its interior. The plug-in printed circuit boards (see Chap. 7 Fig. 1) may then be readily exchanged or checked. Functions of the p.c. boards are as follows:

Front board, A1 - Waveform generator for sweep, markers and square wave
Second board, A2 - Power supply regulator circuits
Third board, A3 (if Option-01 is included) - Remote programming.

Removing both top and bottom covers provides access to test points while the equipment is operating.

31. The following is a list of figures which illustrate the locations of the various components and test points

	Chap.	Fig.
Main assembly components - inside of front and rear panels	5	9
Assembly A1 components and test points	7	3
Assembly A2 components and test points	7	7
Assembly A3 components and test points	7	9
Assembly A4 components and test points	7	1
Assembly A5 components	5	7
Assembly A6 components	7	11

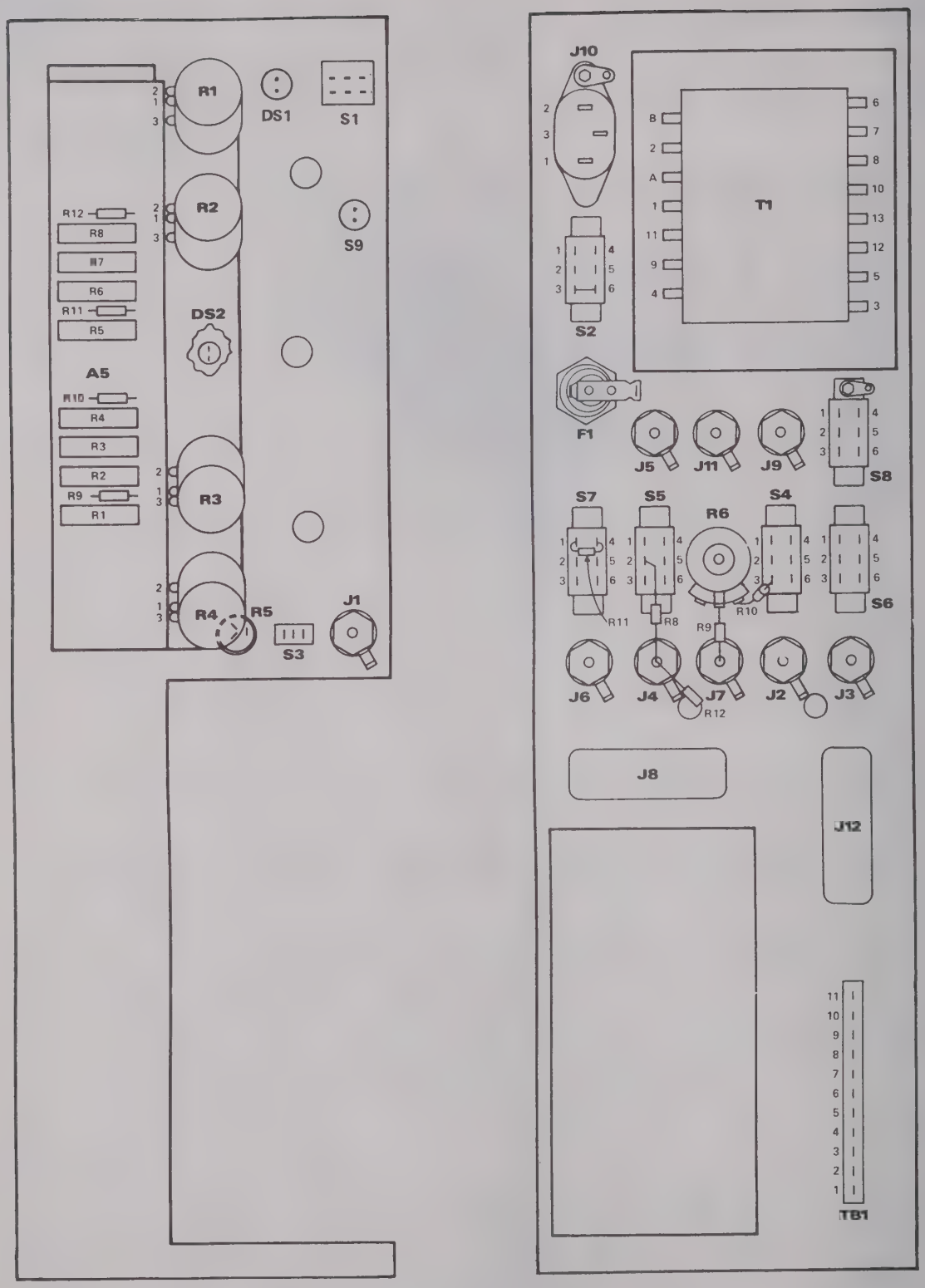

Fig. 9 Identification of main assembly components located on front and back panels

Chapter 6

REPLACEABLE PARTS

CONTENTS

Para.
1 Introduction
3 Ordering

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1 Abbreviations ... 2
2 Main assembly ... 3
3 Assembly A1 : Marker and waveform generator, 6700/201 ... 4
4 Assembly A2 : Power supplies, 6700/202 ... 9
5 Assembly A3 : Remote programming (Option-01), 6700/203 ... 11
6 Assembly A4 : Mother board, 6700/204 ... 12
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8 Assembly A6 : Dwell-time and Z-blanking processor ... 13
Assembly A7 : Cableform ... 13

INTRODUCTION

1. This chapter provides information for procuring replaceable parts for the type 6700B mainframe - see Table 1 for an explanation of abbreviations.

2. While equivalent alternatives to some components may be included during manufacture, Marconi Instruments Ltd., Microwave Products Division, should be consulted before any other alternatives are fitted when the equipment is being serviced.

ORDERING

3. Send your order for replacement parts to our Technical Services Department. Specify the following information for each part required.

(1) Type and serial number of instrument.

(2) Circuit reference.

(3) Description.

Marconi Instruments Ltd.,
Microwave Products Division
Gunnels Wood Road,
Stevenage SG1 2AU
ENGLAND.

or contact your local Marconi Instruments, Microwave Products Division representative.

TABLE 1 ABBREVIATIONS

A	: amperes	MIN	: minimum
AMPL	: amplifier	N	: nano = 10^{-9}
AM	: amplitude modulation	NC	: normally closed
APPROX	: approximate	NEG	: negative
ASS'Y	: assembly	NO	: normally open
AUX	: auxiliary	Ω	: ohm
AVG	: average	PC	: printed circuit
BAL	: balance	pF	: picofarad = 10^{-12} farad
dB	: decibel	P/O	: part of
dBm	: decibel (referred to 1 milliwatt)	P-P	: peak-to-peak
		RECT	: rectifier
EXT	: external	RES	: resistance or resistor
F	: farad	RET	: return
FIG	: figure	REV	: reverse
FM	: frequency modulation	RF	: radio frequency
G	: giga = 10^{9}	RMS	: square root of mean square
GND	: ground		
H	: henry	SEC	: second
Hz	: cycle per second	SW	: switch
INT	: internal	SYM	: symmetrical
J	: jack (socket)	TRIG	: trigger
K	: kilo = 10^{3}	TYP	: typical
LIN	: linear	μ	: micro = 10^{-6}
M	: milli = 10^{-3}	V	: volt
MAX	: maximum	VAR	: variable
MEG	: meg = 10^{6}		

Table 2 Main assembly parts list

Circuit ref.	Description	Mfr & type
DS1	Indicator Neon 15V	Arcolectric SL41 (red)
DS2	Indicator LED	Arcolectric SL42 (red)
F1	Fuse link anti-surge 1.6A(230V) 20mm x 5mm 3.15A(115V)	
J1	Connector BNC	Greenpar GE35027/BN
J2	Connector BNC	Greenpar GE35027/BN
J3	Connector BNC	Greenpar GE35027/BN
J4	Connector BNC	Greenpar GE35027/BN
J5	Connector BNC	Greenpar GE35027/BN
J6	Connector BNC	Greenpar GE35027/BN
J7	Connector BNC	Greenpar GE35027/BN
J8	Connector 36 pin	Amphenol 57-20360
J9	Connector BNC	Greenpar GE35027/BN
J10	Plug line input	Bulgin P580
J11	Connector BNC	Greenpar GE35027/BN
J12	Connector, 36 pin	Amphenol 57-40360
J14	Connector 5 pin	Amphenol 126-218
P1	Connector 22+22 pin	Cinch F97 25122/30/160
P2	Connector 22+22 pin	Cinch F97 25122/30/160
P14	Connector 5 pin	Amphenol 126-217
R1	Res var 1kΩ 1in 10% 2W	Bourns MI Drg 6700/100
R2	Res var 1kΩ 1in 10% 2W	Bourns MI Drg 6700/100
R3	Res var 1kΩ 1in 10% 2W	Bourns MI Drg 6700/100
R4	Res var 1kΩ 1in 10% 2W	Bourns MI Drg 6700/100
R5	Res var 1kΩ 1in 10% 1W	Spectrol-Reliance 47P
R6	Res var 10kΩ 1in 20% 1/2W	AB Controls type 45
R7	Res 4.7kΩ 2% 0.25W	Mullard MR25
R8	Res 4.7kΩ 2% 0.25W	Mullard MR25
R9	Res 2.2kΩ 2% 0.25W	Mullard MR25
R10	Res 2.2kΩ 2% 0.25W	Mullard MR25
R11	Res 22kΩ 2% 0.25W	Mullard MR25
R12	Res 4.7kΩ 2% 0.25W	Mullard MR25
R13	Res 4.7kΩ 2% 0.25W	Mullard MR25
S1	Switch toggle	Arrow CTS6
S2	Switch slide	Arcolectric T225
S3	Switch toggle	Arrow CTS3
S4	Switch slide	Arcolectric T225
S5	Switch slide	Arcolectric T225
S6	Switch slide	Arcolectric T225
S7	Switch slide	Arcolectric T225
S8	Switch slide	Arcolectric T225
S9	Switch pushbutton	Bulgin MP16 (red)
T1	Transformer power	MI Drg 6700/300
TB1	Terminal block	Kulka 410-Y-11
TB2	Terminal board	MI Drg 6700/206
B1	Fan 115V	Etri 126FL01
	Fuse-holder	Bulgin F296

Table 2 Main assembly parts list (contd.)

Circuit ref.	Description	Mfr. & type
	Jumper link for TB1	Kulka 410-J
F1,M1, M2,F2	Control knob	Elma 70-14-1/4 black
Trig. function, Time	Control knob	Elma 73-21-1/4 black
Markers, Time (var)	Control knob	Elma 71-14-1/8 red
Sweep out	Control knob	Elma 71-14-1/4 black
Sweep out	Nut cover	Elma 1455-14 black
F1,M1, M2,F2	Nut cover	Elma 1454-14 black
Sweep function	Knob cap	Elma 1450-21 black
Markers, Time	Knob cap	Elam 1450-14 red
Sweep out	Knob cap	Elam 1450-14 black
F1,M1, M2,F2	Knob cap	Elma 1450-14 black
	Mains lead (line cord)	MI M43123-076
	Screw scale retaining	MI Drg 6700/058
	Extender board assembly (optional accessory)	MI Drg 6700/241

Table 3 Assembly A1:Marker & waveform generator, 6700/201

Circuit ref.	Description	Mfr. & type
A1C1	Cap 1000pF ±10% 200V	Vitramon CK05BX102K
A1C2	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A1C3	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A1C4	Cap 1000pF ±10% 200V	Vitramon CK05BX102K
A1C5	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A1C6	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A1C7	Cap 100µF -10/+50% 25V	Erie 201 series
A1C8	Cap 100µF -10/+50% 25V	Erie 201 series
A1C9	Cap 100pF ±10% 200V	Vitramon CK05BX101K
A1C10	Cap 1000pF ±10% 200V	Vitramon CK05BX102K
A1C11	Cap 2200pF ±10% 200V	Vitramon CK06BX222K
A1C12	Cap 4700pF ±10% 200V	Vitramon CK06BX472K
A1C13	Cap 470pF ±10% 200V	Vitramon CK05BX471K
A1C14	Cap 100pF ±10% 200V	Vitramon CK05BX101K
A1C15	Cap 100µF -10/+50% 25V	Erie 201 series
A1C16	Cap 15pF ±10% 200V	Vitramon CK05BX150K
A1C17	Cap 3.3pF ±0.5pF 250V	Erie type 861
A1C18	Cap 47pF ±10% 200V	Vitramon CK05BX470K
A1C19	Cap 15pF ±10% 200V	Vitramon CK05BX150K
A1C20	Cap 100µF -10/+50% 25V	Erie 201 series

Table 3 Assembly A1:Marker & waveform generator, 6700/201 (contd.)

Circuit ref.	Description	Mfr. & type
A1C21	Cap 3.3pF ±0.5pF 250V	Erie type 861
A1C22	Cap. 47pF ±10% 200V	Vitramon CKO5BX470K
A1C23	Cap. 0.1µF ±10% 100V	Vitramon CKO6BX104K
A1C24	Cap tant 1µF ±20% 35V	ITT TAG 1.0/35
A1C25	Cap 22pF ±10% 200V	Erie CKO5BX220K
A1C26	Cap 100pF ±10% 200V	Vitramon CKO5BX101K
A1C27	Cap 100pF ±10% 200V	Vitramon CKO5BX101K
A1C28	Cap 22pF ±10% 200V	Vitramon CKO5BX220K
A1C29	Cap 22pF ±10% 200V	Vitramon CKO5BX220K
A1C31	Cap 220pF ±10% 200V	Vitramon CKO5BX221K
A1CR1	Diode, zener 5% 6.2V	Mullard BZY88-C6V2
A1CR2	Diode rect	Mullard IN4148
A1CR3	Diode rect	Mullard IN4148
A1CR4	Diode rect	Mullard IN4148
A1CR5	Diode rect	Mullard IN4148
A1CR6	Diode rect	Mullard IN4148
A1CR7	Diode rect	Mullard IN4148
A1CR8	Diode rect	Mullard IN4148
A1CR9	Diode rect	Mullard IN4148
A1CR10	Diode rect	Mullard IN4148
A1CR11	Diode rect	Mullard IN4148
A1CR11	Diode rect	Mullard IN4148
A1CR12	Diode rect	Mullard IN4148
A1CR13	Diode rect	Mullard IN4148
A1CR14	Diode rect	Mullard IN4148
A1CR15	Diode rect	Mullard IN4148
A1CR16	Diode rect	Mullard IN4148
A1CR17	Diode rect	Mullard IN4148
A1CR18	Diode rect	Mullard IN4148
A1CR19	Diode rect	Mullard IN4148
A1CR20	Diode rect	Mullard IN4148
A1CR21	Diode rect	Mullard IN4148
A1CR22	Not used	
A1CR23	Diode rect	Mullard IN4148
A1CR24	Diode rect	Mullard IN4148
A1CR25	Diode rect	Mullard IN4148
A1CR26	Diode rect	Mullard IN4148
A1CR27	Diode rect	Mullard IN4148
A1CR28	Diode rect	Mullard IN4148
A1CR29	Diode rect	Mullard IN4148
A1CR30	Diode rect	Mullard IN4148
A1CR31	Diode rect	Mullard IN4148
A1CR32	Diode rect	Mullard IN4148
A1CR33	Diode rect	Mullard IN4148
A1CR34	Diode rect	Mullard IN4148
A1CR35	Diode zener 5% 12V	Mullard BZY88-C12

Table 3 Assembly A1:Marker & waveform generator, 6700/201 (contd.)

Circuit ref.	Description	Mfr. & type
A1CR36	Diode rect	Mullard IN4148
A1CR37	Diode rect	Mullard IN4148
A1CR38	Diode rect	Mullard IN4148
A1CR39	Diode rect	Mullard IN4148
A1CR40	Diode rect	Mullard IN4148
A1CR41	Diode rect	Mullard IN4148
A1CR42	Diode rect	Mullard IN4148
A1CR43	Diode rect	Mullard IN4148
A1CR44	Diode rect	Mullard IN4148
A1CR45	Diode rect	Mullard IN4148
A1IC1	Integ circuit	Motorola MC1458P-1
A1IC2	Integ circuit	Motorola MC1458P-1
A1IC3	Integ circuit	Motorola MC1458P-1
A1IC4	Integ circuit	Motorola MC1458P-1
A1IC5	Integ circuit	Motorola MC1458P-1
A1IC6	Integ circuit	Motorola MC1437L
A1Q1	Transistor	Motorola 2N4403
A1Q2	Transistor	Motorola 2N4403
A1Q3	Transistor	Motorola 2N4403
A1Q4	Transistor	Motorola 2N4403
A1Q5	Transistor	Motorola 2N4403
A1Q6	Transistor	Motorola 2N4401
A1Q7	Transistor	Motorola 2N4401
A1Q8	Transistor	ITT BSY79
A1Q9	Transistor	Motorola 2N4401
A1Q10	Transistor	Motorola 2N4403
A1Q11	Transistor	Motorola 2N4401
A1Q12	Transistor	Motorola 2N4403
A1Q13	Transistor	Motorola 2N4401
A1Q14	Transistor	Motorola 2N4401
A1Q15	Transistor	Motorola 2N4403
A1Q16	Transistor	Motorola 2N4403
A1Q17	Transistor	Motorola 2N4401
A1R1	Res 4.7M 10% 0.33W	Mullard CR25
A1R2	Res 10kΩ 2% 0.25W	Mullard MR25
A1R3	Res 4.7kΩ 2% 0.25W	Mullard MR25
A1R4	Res 1kΩ 2% 0.25W	Mullard MR25
A1R5	Res 470Ω 2% 0.25W	Mullard MR25
A1R6	Res 1kΩ 2% 0.25W	Mullard MR25
A1R7	Res 4.7kΩ 2% 0.25W	Mullard MR25
A1R8	Res 10kΩ 2% 0.25W	Mullard MR25
A1R9	Res 4.7kΩ 2% 0.25W	Mullard MR25
A1R10	Res 22kΩ 2% 0.25W	Mullard MR25
A1R11	Res 22kΩ 2% 0.25W	Mullard MR25
A1R12	Res 1.5kΩ 2% 0.25W	Mullard MR25
A1R13	Res 220Ω 2% 0.25W	Mullard MR25

Table 3 Assembly A1:Marker & waveform generator 6700/201 (contd.)

Circuit ref.	Description	Mfr. & type
A1R14	Res. 2.2kΩ 2% 0.25W	Mullard MR25
A1R15	Res. 22kΩ 2% 0.25W	Mullard MR25
A1R16	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A1R17	Res. 68kΩ 2% 0.25W	Mullard MR25
A1R18	Res. 22kΩ 2% 0.25W	Mullard MR25
A1R19	Res. 22kΩ 2% 0.25W	Mullard MR25
A1R20	Res. 68kΩ 2% 0.25W	Mullard MR25
A1R21	Res. 2.2kΩ 2% 0.25W	Mullard MR25
A1R22	Res. 18kΩ 2% 0.25W	Mullard MR25
A1R23	Res. 33kΩ 2% 0.25W	Mullard MR25
A1R24	Res. 10.0kΩ 1% 1/8W	Holco H8/50
A1R25	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R26	Res. 100Ω 2% 0.25W	Mullard MR25
A1R27	Res. 5.62kΩ 1% 1/8W	Holco H8/50
A1R28	Res. 10Ω 2% 0.25W	Mullard MR25
A1R29	Res. 10Ω 2% 0.25W	Mullard MR25
A1R30	Res. 10.0kΩ 1% 1/8W	Holco H8/50
A1R31	Res. 178kΩ 1% 1/8W	Holco H8/50
A1R32	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A1R33	Res. 10.0kΩ 1% 1/8W	Holco H8/50
A1R34	Res. 220Ω 2% 0.25W	Mullard MR25
A1R35	Res. 220Ω 2% 0.25W	Mullard MR25
A1R36	Res. 220Ω 2% 0.25W	Mullard MR25
A1R37	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R38	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R39	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A1R40	Res. 47Ω 2% 0.25W	Mullard MR25
A1R41	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R42	Res. 470Ω 2% 0.25W	Mullard MR25
A1R43	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R44	Res. 10kΩ 2% 0.25W	Mullard MR25
A1R45	Res. 4.7kΩ 2% 0.25W	Mullard MR25
A1R46	Res. 15.00kΩ 0.05% 0.1W	ERG EE-0.10-15K-AC4
A1R47	Res. 100Ω 2% 0.25W	Mullard MR25
A1R48	Res. 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A1R49	Res. 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A1R50	Res. 1.5M 10% 0.33W	Mullard CR25
A1R51	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A1R52	Res. 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A1R53	Res. 3.3kΩ 2% 0.25W	Mullard MR25
A1R54	Res. 1.5M 10% 0.33W	Mullard CR25
A1R55	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A1R56	Res. 100kΩ 1% 1/8W	Holco H8/50
A1R57	Res. 100kΩ 1% 1/8W	Holco H8/50
A1R58	Res. 2.00kΩ 0.05% 0.1W	ERG EE-0.10-2K-AC4
A1R59	Res. 2.00kΩ 0.05% 0.1W	ERG EE-0.10-2K-AC4

Table 3 Assembly A1:Marker & waveform generator

6700/201 (contd.)

Circuit ref.	Description	Mfr. & type
A1R60	Res 1M 5% 0.33W	Mullard CR25
A1R61	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A1R62	Res 680Ω 2% 0.25W	Mullard MR25
A1R63	Res 2.00kΩ 0.05% 0.1W	ERG EE-0.10-2K-AC4
A1R64	Res 3.01kΩ 1% 1/8W	Holco H8/50
A1R65	Res 220Ω 2% 0.25W	Mullard MR25
A1R66	Res 2.15kΩ 1% 1/8W	Holco H8/50
A1R67	Res 220Ω 2% 0.25W	Mullard MR25
A1R68	Res 10.0kΩ 1% 1/8W	Holco H8/50
A1R69	Res 10.0kΩ 1% 1/8W	Holco H8/50
A1R70	Res 10.0kΩ 1% 1/8W	Holco H8/50
A1R71	Res 10kΩ 2% 0.25W	Mullard MR25
A1R72	Res 2.2kΩ 2% 0.25W	Mullard MR25
A1R73	Res 6.8kΩ 2% 0.5W	Mullard MR30
A1R74	Res 470Ω 2% 0.25W	Mullard MR25
A1R75	Res 100.0kΩ 0.05% 0.1W	ERG EE-0.10-100K-AC4
A1R76	Res 100.0kΩ 0.05% 0.1W	ERG EE-0.10-100K-AC4
A1R77	Jumper	
A1R78	Res 1.5M 10% 0.33W	Mullard CR25
A1R79	Res 47kΩ 2% 0.25W	Mullard MR25
A1R80	Res 220Ω 2% 0.25W	Mullard MR25
A1R81	Res 100kΩ 2% 0.25W	Mullard MR25
A1R82	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R83	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R84	Res 10Ω 2% 0.25W	Mullard MR25
A1R85	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R86	Res 1.40kΩ 1% 1/8W	Holco H8/50
A1R87	Res 100kΩ 2% 0.25W	Mullard MR25
A1R88	Res 15kΩ 2% 0.25W	Mullard MR25
A1R89	Res 1kΩ 2% 0.25W	Mullard MR25
A1R90	Res 100.0kΩ 0.05% 0.1W	ERG EE-0.10-100K-AC4
A1R91	Res 100.0kΩ 0.05% 0.1W	ERG EE-0.10-100K-AC4
A1R92	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A1R93	Res 1.5M 10% 0.33W	Mullard CR25
A1R94	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A1R95	Res 10Ω 2% 0.25W	Mullard MR25
A1R96	Res 47kΩ 2% 0.25W	Mullard MR25
A1R97	Res 220Ω 2% 0.25W	Mullard MR25
A1R98	Res 100kΩ 2% 0.25W	Mullard MR25
A1R99	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R100	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R101	Res 10Ω 2% 0.25W	Mullard MR25
A1R102	Res 2.80kΩ 1% 1/8W	Holco H8/50
A1R103	Res 1.40kΩ 1% 1/8W	Holco H8/50
A1R104	Res 100kΩ 2% 0.25W	Mullard MR25
A1R105	Res 15kΩ 2% 0.25W	Mullard MR25
A1R106	Res 1kΩ 2% 0.25W	Mullard MR25

Table 3 Assembly A1:Marker & waveform generator 6700/201 (contd.)

Circuit ref.	Description	Mfr. & type
A1R107	Res 15kΩ 2% 0.25W	Mullard MR25
A1R108	Res 100Ω 2% 0.25W	Mullard MR25
A1R109	Res 1.5kΩ 2% 0.25W	Mullard MR25
A1R110	Res 100kΩ 2% 0.25W	Mullard MR25
A1R111	Res 1.5kΩ 2% 0.25W	Mullard MR25
A1R112	Res 100Ω 2% 0.25W	Mullard MR25
A1R113	Res 3.32kΩ 1% 1/8W	Holco H8/50
A1R114	Res 2.15kΩ 1% 1/8W	Holco H8/50
A1R115	Res 2.55kΩ 1% 1/8W	Holco H8/50
A1R116	Res 8.2kΩ 2% 0.25W	Mullard MR25
A1R117	Res 3.16kΩ 1% 1/8W	Holco H8/50
A1R118	Res 4.7kΩ 2% 0.25W	Mullard MR25
A1R119	Res 100kΩ 2% 0.25W	Mullard MR25
A1R120	Res 1kΩ 2% 0.25W	Mullard MR25
A1R121	Res 1.5kΩ 2% 0.25W	Mullard MR25
A1R122	Res 470kΩ 5% 0.33W	Mullard CR25
A1R123	Res 100Ω 2% 0.25W	Mullard MR25

Table 4 Assembly A2:Power supplies 6700/202

Circuit ref.	Description	Mfr. & type
A2C1	Cap 0.1µF ±20% 250V	ITT MPT/1
A2C2	Cap 2200µF -10/+75% 25V	Sprague 39D228G025
A2C3	Cap 100µF -10/+50% 40V	Erie 20100 series
A2C4	Cap tant 10µF ±20% 35V	ITT TAG 10/35
A2C5	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A2C6	Cap 39pF ±10% 200V	Vitramon CK05BX390K
A2C7	Cap 56pF ±10% 200V	Vitramon CK05BX560K
A2C8	Cap 150pF ±10% 200V	Vitramon CK05BX151K
A2C9	Cap 100pF ±10% 200V	Vitramon CK05BX101K
A2C10	Cap 47µF -10/+50% 40V	Erie 20100 series
A2C11	Cap 0.22µF ±10% 63V	Mullard 344 25224
A2C12	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A2C13	Cap 4700pF ±10% 200V	Vitramon CK06BX472K
A2C14	Cap 100µF -10/+50% 25V	Erie 20100 series
A2C15	Cap 2200µF -10/+75% 25V	Sprague 39D228G025
A2C16	Cap 100µF -10/+50% 25V	Erie 20100 series
A2C17	Cap 220pF ±10% 200V	Vitramon CK05BX221K
A2C18	Cap tant 10µF ±20% 35V	ITT TAG 10/35
A2C19	Cap 150pF ±10% 200V	Vitramon CK05BX151K
A2C20	Cap 100pF ±10% 200V	Vitramon CK05BX101K
A2C21	Cap 39pF ±10% 200V	Vitramon CK05BX390K
A2C22	Cap 56pF ±10% 200V	Vitramon CK05BX560K
A2C23	Cap 47µF -10/+50% 25V	Erie 20100 series

Table 4 Assembly A2:Power supplies 6700/202 (contd.)

Circuit ref.	Description	Mfr. & type
A2C24	Cap 0.1µF ±20% 250V	ITT MPT/1
A2C25	Cap 4000µF -10/+75% 15V	Sprague 39D408G015
A2C26	Cap 1000pF ±10% 200V	Vitramon CK05BX102K
A2C27	Cap 56pF ±10% 200V	Vitramon CK05BX560K
A2C28	Cap 150pF ±10% 200V	Vitramon CK05BX151K
A2C29	Cap 68pF ±10% 200V	Vitramon CK05BX680K
A2C30	Cap 100pF ±10% 200V	Vitramon CK05BX101K
A2C31	Cap 47µF -10/+50% 25V	Erie 20100 series
A2C32	Cap 0.01µF ±10% 200V	Vitramon CK06BX103K
A2CR1	Bridge Rect	Power Comp's BR82D
A2CR2	Diode	Mullard IN4148
A2CR3	Diode	Mullard IN4148
A2CR4	Diode	Mullard IN4148
A2CR5	Diode zener TC = 5ppm 6.2V	Transitron IN829
A2CR6	Diode	Mullard IN4148
A2CR7	Diode	Mullard IN4148
A2CR8	Diode	Mullard IN4148
A2CR9	Diode	Mullard IN4148
A2CR10	Bridge rect	Power Comps BR82D
A2CR11	Diode	Mullard IN4148
A2CR12	Diode	Mullard IN4148
A2CR13	Diode zener 6.2V	Mullard BZY88C6V2
A2IC1	Integrated circuit	Motorola MC1437L
A2IC2	Integrated circuit	Motorola MC1437L
A2Q1	Transistor	Motorola MJ1000
A2Q2	Transistor	Motorola 2N4403
A2Q3	Transistor	Motorola 2N4403
A2Q4	Transistor	Motorola 2N4401
A2Q5	Transistor	Motorola MJ900
A2Q6	Transistor	Motorola 2N4403
A2Q7	Transistor	Motorola 2N4403
A2Q8	Transistor	Motorola 2N4403
A2Q9	Transistor	Motorola 2N4403
A2Q10	Transistor	Motorola MJ900
A2Q11	Transistor	Motorola 2N4403
A2Q12	SCR	Motorola 2N4441
A2R1	Res 820Ω 2% 0.25W	Mullard MR25
A2R2	Res 1.8kΩ 2% 0.25W	Mullard MR25
A2R3	Res 1kΩ 2% 0.25W	Mullard MR25
A2R4	Res 2kΩ 2% 0.25W	Mullard MR25
A2R5	Res 100Ω 2% 0.25W	Mullard MR25
A2R6	Res 1kΩ 2% 0.25W	Mullard MR25
A2R7	Res 0.47Ω 5% 3W	CGS C3A
A2R8	Res 1.2kΩ 2% 0.25W	Mullard MR25
A2R9	Res 14.7kΩ 1% 1/8W	Holco H8/50
A2R10	Res var 500Ω 10% 0.75W	Spectrol-Reliance 43P
A2R11	Factory selected 1% 1/8W	Holco H8/50

Table 4 Assembly A2:Power supplies 6700/202 (contd.)

Circuit ref.	Description	Mfr. & type
A2R12	Res 4.7kΩ 2% 0.25W	Mullard MR25
A2R13	Res 1.21kΩ 1% 1/8W	Holco H8/50
A2R14	Res 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A2R15	Res 3.00kΩ 0.05% 0.1W	ERG EE-0.10-3K-AC4
A2R16	Res 1.2kΩ 2% 0.25W	Mullard MR25
A2R17	Res 2.00kΩ 0.05% 0.1W	ERG EE-0.10-2K-AC4
A2R18	Res 1.5kΩ 2% 0.25W	Mullard MR25
A2R19	Res 220Ω 2% 0.25W	Mullard MR25
A2R20	Res 10Ω 2% 0.25W	Mullard MR25
A2R21	Res 47Ω 2% 0.5W	Mullard MR30
A2R22	Res 4.7kΩ 2% 0.25W	Mullard MR25
A2R23	Res 1kΩ 2% 0.25W	Mullard MR25
A2R24	Res 2kΩ 2% 0.25W	Mullard MR25
A2R25	Res 1kΩ 2% 0.25W	Mullard MR25
A2R26	Res 100Ω 2% 0.25W	Mullard MR25
A2R27	Res 0.47Ω 5% 3W	CGS C3A
A2R28	Res 1.2kΩ 2% 0.25W	Mullard MR25
A2R29	Res 10Ω 2% 0.25W	Mullard MR25
A2R30	Res 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A2R31	Res 0.47Ω 5% 3W	CGS C3A
A2R32	Res 1.8kΩ 2% 0.25W	Mullard MR25
A2R33	Res 1.2kΩ 2% 0.25W	Mullard MR25
A2R34	Res 15.0kΩ 1% 1/8W	Holco H8/50
A2R35	Res 3.3kΩ 2% 0.25W	Mullard MR25
A2R36	Res 5.11kΩ 1% 1/8W	Holco H8/50
A2R37	Res 100Ω 2% 0.25W	Mullard MR25

Table 5 Assembly A3:Remote programming (Option-01) 6700/203

Circuit ref.	Description	Mfr. & type
A3CR1	Diode	Mullard IN4148
A3IC1	Integrated circuit	Motorola MC7475P
A3IC2	Integrated circuit	Motorola MC7475P
A3IC3	Integrated circuit	Motorola MC7475P
A3IC4	Integrated circuit	Motorola MC834P
A3IC5	D-A converter	Zeltex ZD433
A3K1	Relay	Potter & Brumfield JRM1049
A3Q1	Transistor	Motorola 2N4401
A3R1	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A3R2	Res var 10kΩ 10% 0.75W	Spectrol-Reliance 43P
A3R3	Res var 500Ω 10% 0.75W	Spectrol-Reliance 43P
A3R4	Res 5.11kΩ 1% 1/8W	Holco H8/50
A3R5	Res 6.8kΩ 2% 0.25W	Mullard MR25
A3R6	Res 6.8kΩ 2% 0.25W	Mullard MR25
A3R7	Res 4.7kΩ 2% 0.25W	Mullard MR25

Table 6 Assembly A4:Mother board 6700/204

Circuit ref.	Description	Mfr. & type
A4A1	Sweep function switch assembly comprising	MI Drg. 6700/012
A4A1S1	Sweep function switch	MI Drg. 6700/033
A4A1R1	Res 7.50kΩ 0.05% 0.1W	ERG EE-0.10-7.5K-AC4
A4A2	Sweep time (secs) switch assembly comprising	MI Drg. 6700/013
A4A2S1	Sweep time switch	MI Drg. 6700/031
A4A2R1	Res var 10kΩ 1in 20% 1/2W	Part of 6700/031
A4A2R2	Res 150kΩ 2% 0.25W	Mullard MR25
A4A2R3	Res 1.5M 10% 0.33W	Mullard CR25
A4A2R4	Res 820Ω 2% 0.25W	Mullard MR25
A4A2C1	Cap 0.1µF 20% 250V	Mullard C280AEP100K
A4A2C2	Cap tant 1µF 10% 20V	Union Carbide K1J20K
A4A2C3	Cap tant 10µF 10% 20V	Union Carbide K10J20K
A4A2C4	Cap tant 100µF 10% 20V	Union Carbide K100J20K
A4A3	Sweep trigger switch assembly comprising	MI Drg. 6700/015
A4A3S1	Sweep trigger switch	MI Drg. 6700/032
A4A3R1 (Marker amp)	Res var 10kΩ 1in 20% 1/2W	Part of 6700/032
A4C1	Cap 0.22µF 10% 250V	Erie 51012 series
A4C2	Cap 0.22µF 10% 250V	Erie 51012 series
A4C3	Cap 0.1µF 10% 250V	Erie 51012 series
A4C4	Cap 0.1µF 10% 250V	Erie 51012 series
A4C5	Cap 0.1µF 10% 250V	Erie 51012 series
A4C6	Cap 0.047µF 20% 250V	Erie 61013 series
A4C7	Cap 22µF -10/+50% 63V	Erie 20100 series
A4C8	Cap 1100µF -10/+75% 50V	Sprague 39D118G050HP4
A4C9	Cap 1000µF -10/+50% 63V	Erie 21100 series
A4C10	Cap 1100µF -10/+75% 50V	Sprague 39D118G050HP4
A4C11	Cap 47µF -20/+50% 315V	Erie 21100 series
A4C12	Cap 0.1µF 10% 100V	Vitramon CK06BX104K
A4CR1	Diode zener 5% 6.2V	Mullard BZY88-C6V2
A4CR2	Diode	Mullard IN4148
A4CR3	Diode	Mullard IN4148
A4CR4	Diode	ITT IN4004
A4CR5	Diode	ITT IN4004
A4CR6	Diode	ITT IN4004
A4CR7	Bridge rect	Power Comp's BR82D
A4CR8	Bridge rect	Power Comp's BR82D
A4CR9	Bridge rect	VARO VH247
A4J1	Connector 18+18 pin	Amphenol 225-21821-111
A4J2	Connector 18+18 pin	Amphenol 225-21821-111
A4J3	Connector 18+18 pin	Amphenol 225-21821-111
A4J4	Connector 18+18 pin	Amphenol 225-21821-111
A4K1	Relay	MI 6700/277

Table 6 Assembly A4:Mother board 6700/204 (contd.)

Circuit ref.	Description	Mfr. & type
A4Q1	Transistor	Motorola 2N4401
A4Q2	Transistor	Motorola 2N4401
A4R1	Res 15kΩ 2% 0.25W	Mullard MR25
A4R2	Res 15kΩ 2% 0.25W	Mullard MR25
A4R3	Res 180Ω 2% 0.5W	Mullard MR30
A4R4	Res 10kΩ 2% 0.25W	Mullard MR25
A4R5	Res 100Ω 2% 0.25W	Mullard MR25
A4R6	Res 910Ω 2% 0.5W	Mullard MR30
A4R7	Res 4.7Ω 2% 0.33W	Mullard CR25
A4R8	Res 220Ω 2% 0.25W	Mullard MR25
A4R9	Res 4.7kΩ 2% 0.25W	Mullard MR25
A4R10	Res 7.50kΩ 0.05% 0.1W	ERG EE-0.10-7.5K-AC4
A4R11	Res 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A4R12	Res 10.00kΩ 0.05% 0.1W	ERG EE-0.10-10K-AC4
A4R13	Res 15.00kΩ 0.05% 0.1W	ERG EE-0.10-15K-AC4
A4R14	Res 10kΩ 2% 0.25W	Mullard MR25
A4R15	Res 68kΩ 2% 0.25W	Mullard MR25
A4R16	Res 10kΩ 2% 0.25W	Mullard MR25
A4R17	Res 1M 5% 0.33W	Mullard CR25
A4R18	Res 147kΩ 1% 1/8W	Holco H8/50
A4R19	Res 680Ω 2% 0.5W	Mullard MR30
A4R20	Res 22Ω 2% 0.25W	Mullard MR25
A4R21	Res 2.55kΩ 1% 1/8W	Holco H8/50

Table 7 Assembly A5:Trimmer board 6700/007

Circuit ref.	Description	Mfr. & type
A5R1	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R2	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R3	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R4	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R5	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R6	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R7	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R8	Res var 10Ω 10% 1W	Spectrol-Reliance 43W
A5R9	Res 100kΩ 1% 1/8W	Holco H8/50
A5R10	Res 100kΩ 1% 1/8W	Holco H8/50
A5R11	Res 100kΩ 1% 1/8W	Holco H8/50
A5R12	Res 100kΩ 1% 1/8W	Holco H8/50

Table 8 Assembly A6:Dwell-time and Z-blanking processor

Assembly A7:Cableform assembly

A6C1	Cap 0.01µF ±10% 100V	Vitramon CKO6BX103K
A6CR1	Diode rect	Mullard IN4148
A6CR2	Diode zener 8.2V	Mullard BZY88C8V2
A6CR3	Diode rect	Mullard IN4148
A6CR4	Diode rect	Mullard IN4148
A6CR5	Diode rect	Mullard IN4148
A6CR6	Diode zener 5.1V	Mullard BZY88C5V1

Circuit ref.	Description	Mfr. & type
Table 8 Assembly A6:Dwell-time and Z-blanking processor		
	Assembly A7:Cableform assembly (contd.)	
A6IC1	Integrated circuit	Motorola MC1458P
A6IC2	Integrated circuit	Motorola MC1458P
A6R1	Res. 10kΩ 2% 0.25W	Mullard MR25
A6R2	Res 4.7kΩ 2% 0.25W	Mullard MR25
A6R3	Res 150kΩ 2% 0.25W	Mullard MR25
A6R4	Res 47kΩ 2% 0.25W	Mullard MR25
A6R5	Res 47kΩ 2% 0.25W	Mullard MR25
A6R6	Res 3.3kΩ 2% 0.25W	Mullard MR25
A6R7	Res 10kΩ 2% 0.25W	Mullard MR25
A6R8	Res 2.2kΩ 2% 0.25W	Mullard MR25
A7R1	Res 1.5kΩ 2% 0.25W	Mullard MR25
A7J1	Connector 10 way	Antiference 71-6010-1100-00

Chapter 7

SERVICING DIAGRAMS

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Para.

1 Introduction

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INTRODUCTION

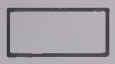
1. This chapter contains the circuit diagrams and component identification illustrations for Assemblies A1, A2, A3, A4 and A6. Component identification for A5 is included in Chap. 5 Fig. 7. Fig. 2 provides an overall view of these assemblies and also contains the circuit diagram for the mainframe, A4 and A5.

TABLE 1 CIRCUIT SYMBOLS

1. Resistance in ohms, capacitance in microfarads unless otherwise indicated.

2. Screwdriver adjustment

Front panel control

3.  Front panel designation

Rear panel designation

4. Printed circuit card border

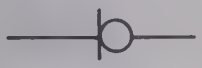
 Main signal path

5. P/O = part of

6. Wiper moves in direction of CW arrow when control rotated clockwise

7. Test point

8. Zener diode; SCR

9.  Constant current diode

10. Indicates socket connection and pin number

11. Indicates solder connection and pin number

12. Denotes chassis ground

13. Denotes signal ground

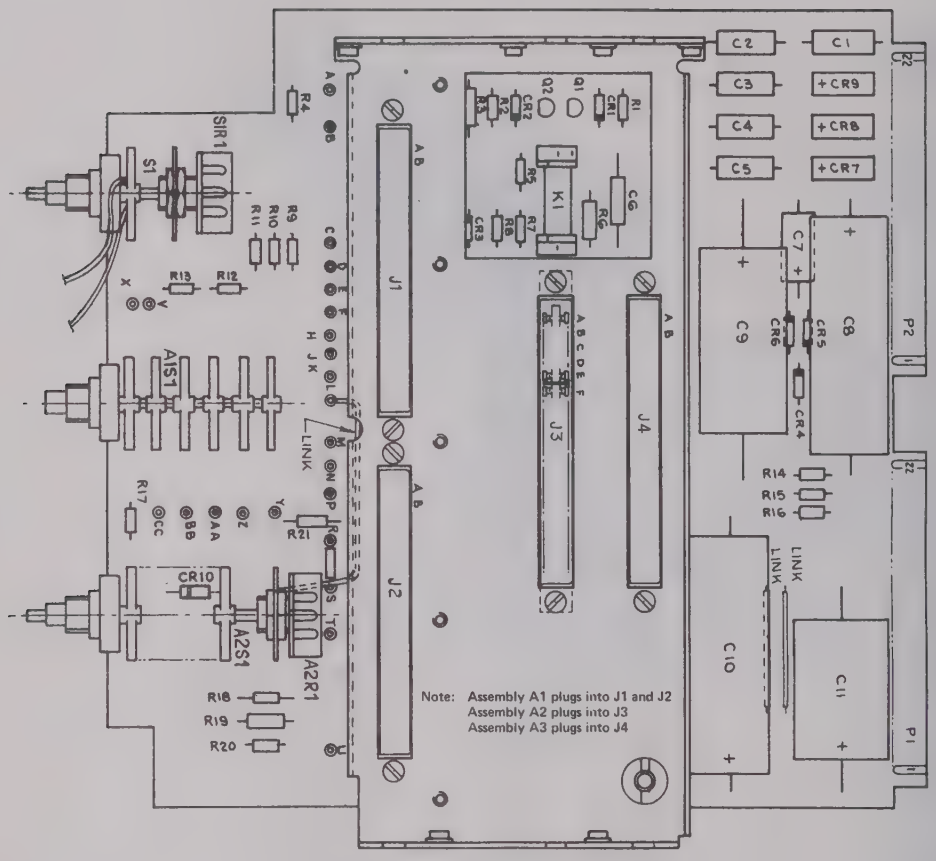


Fig. 1 Assembly A4 : Motherboard, component location

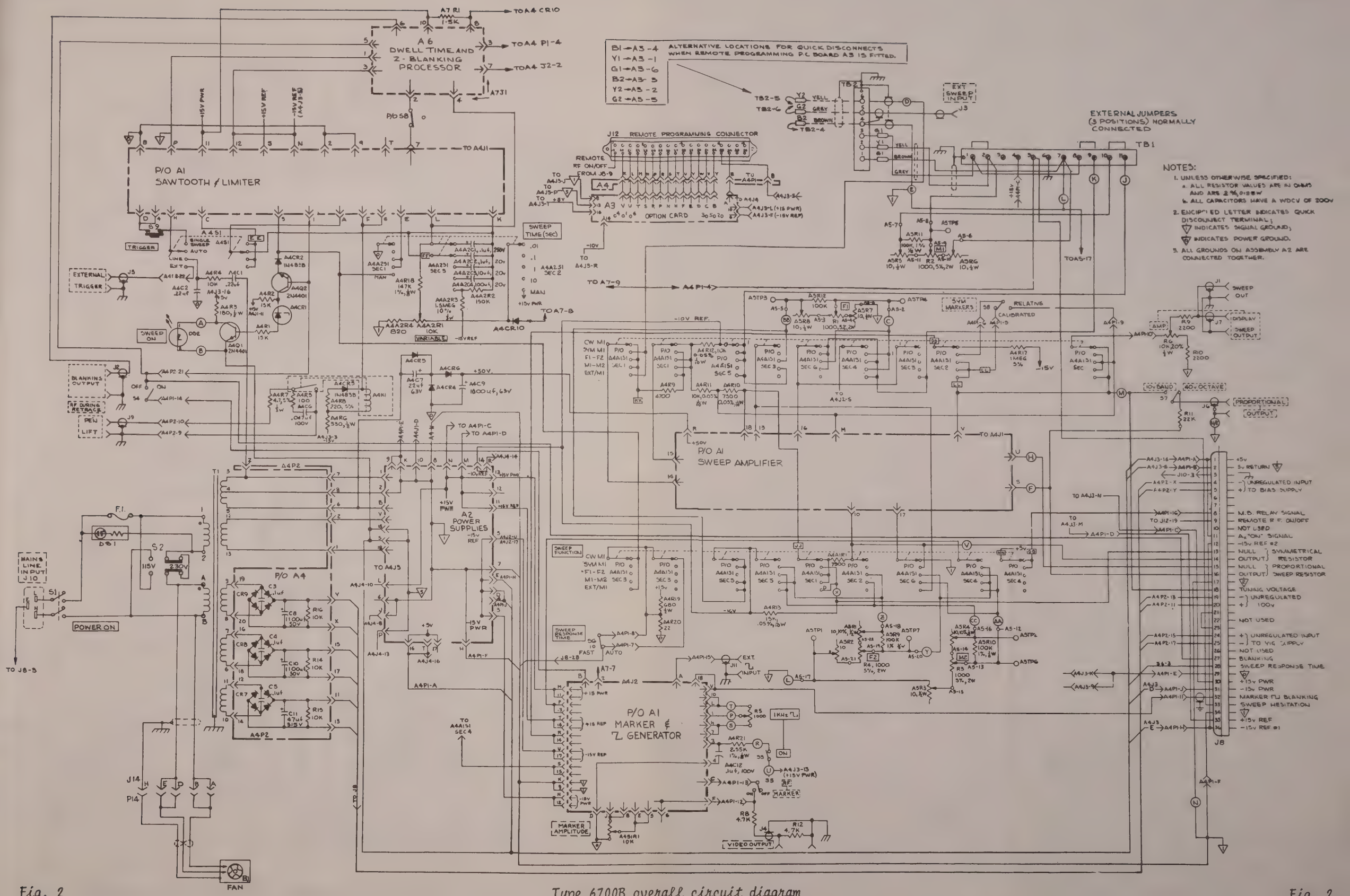


Fig. 2 *Type 6700B overall circuit diagram* *Fig. 2*

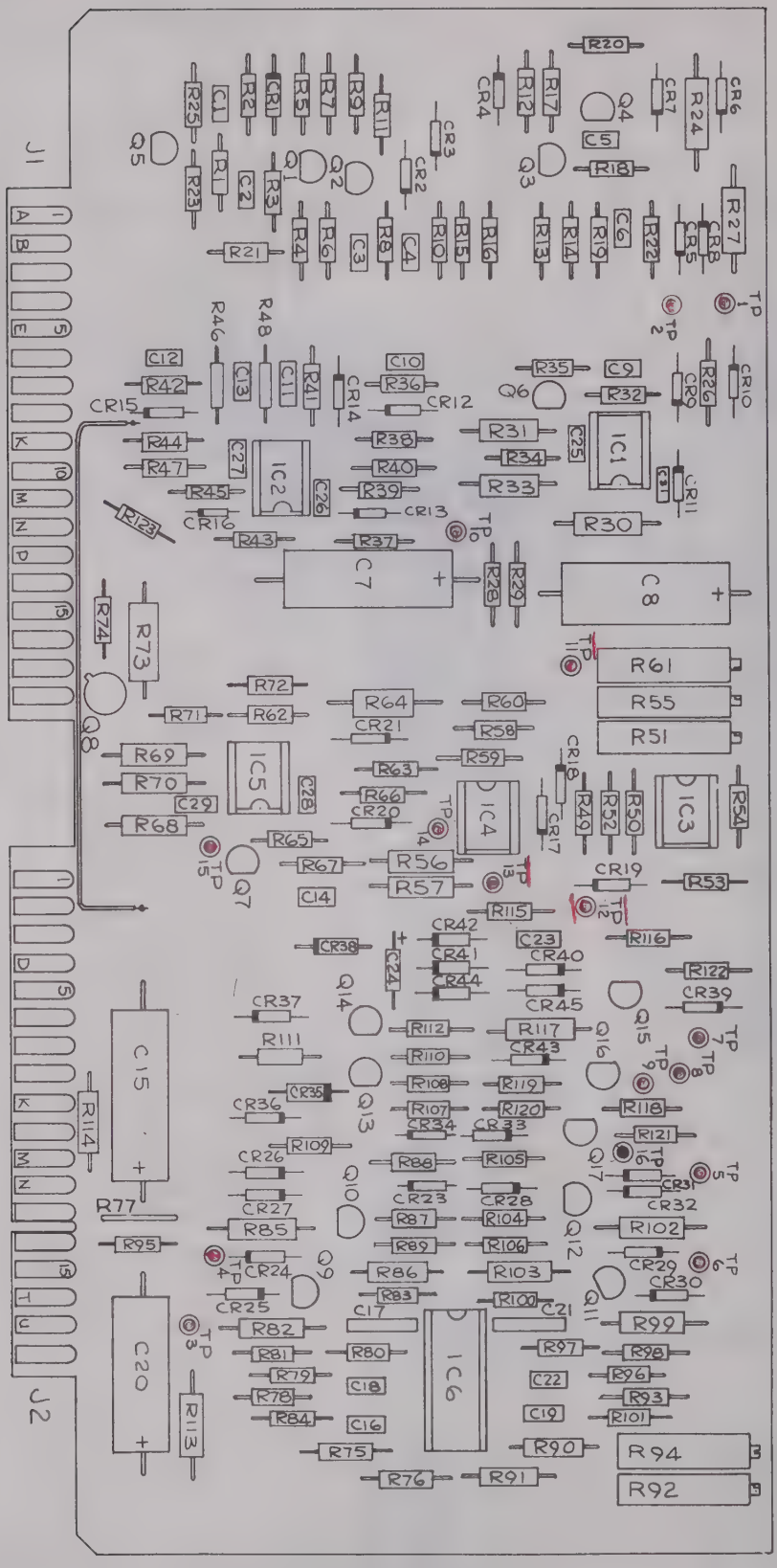
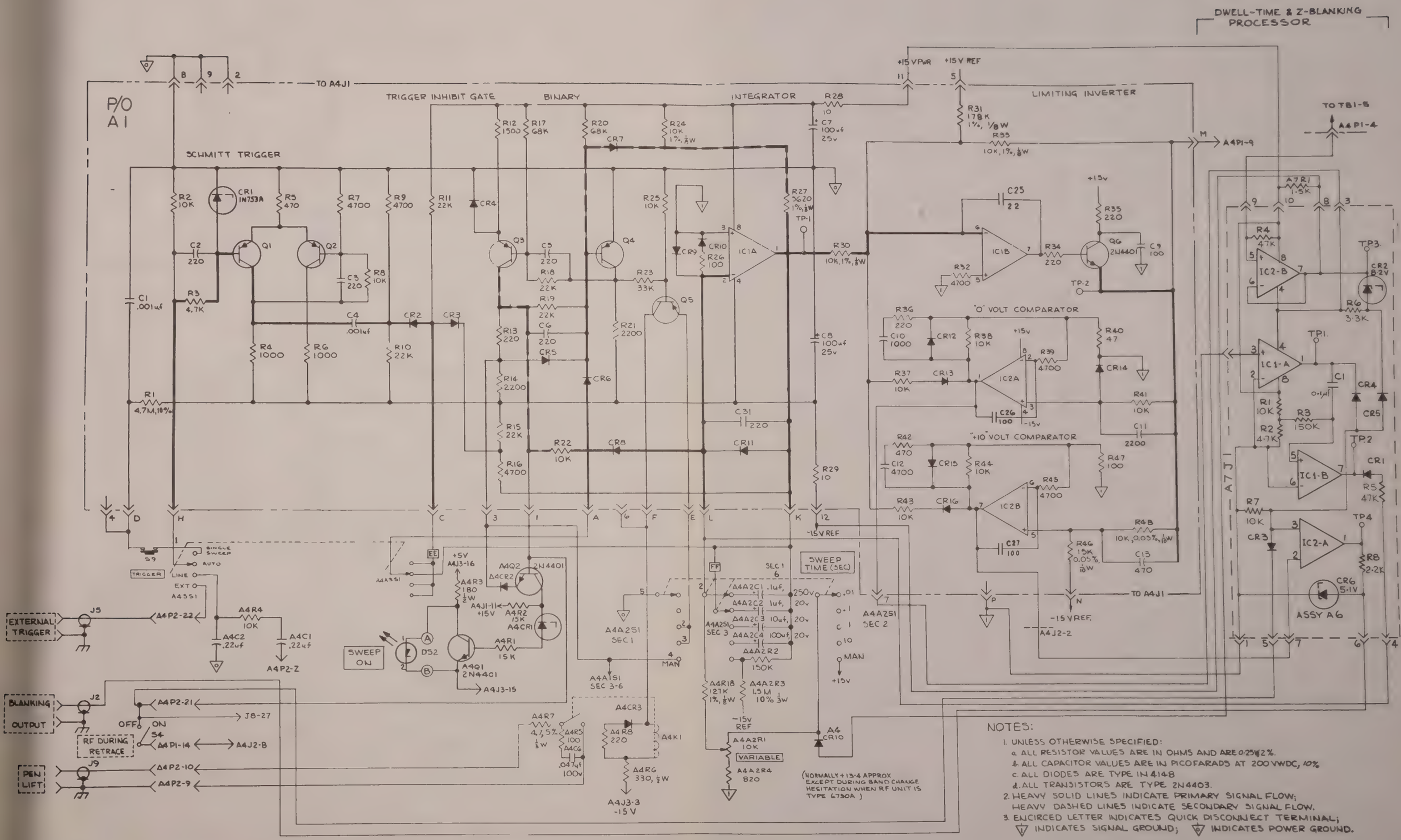


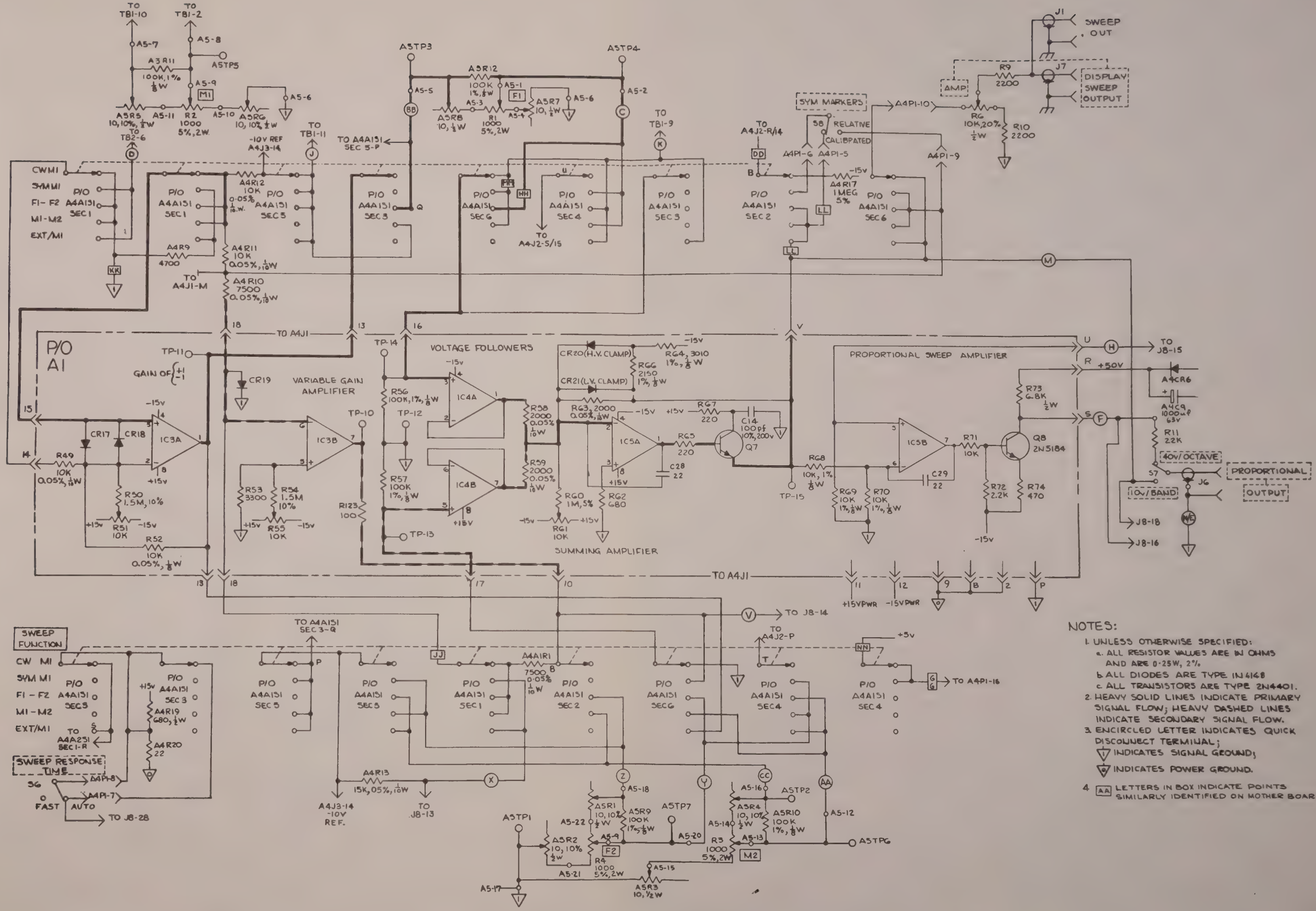
Fig. 3 Assembly A1 sweep and marker generator component identification



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTOR VALUES ARE IN OHMS AND ARE 0·25W 2%.
   b. ALL CAPACITOR VALUES ARE IN PICOFARADS AT 200 VWDC, 10%
   c. ALL DIODES ARE TYPE IN 4148
   d. ALL TRANSISTORS ARE TYPE 2N4403.
2. HEAVY SOLID LINES INDICATE PRIMARY SIGNAL FLOW; HEAVY DASHED LINES INDICATE SECONDARY SIGNAL FLOW.
3. ENCIRCED LETTER INDICATES QUICK DISCONNECT TERMINAL; ▽ INDICATES SIGNAL GROUND; ▽ INDICATES POWER GROUND.

Fig. 4 *Sawtooth and limiter, circuit diagram (Part of A1).* *Fig. 4*



NOTES:

1. UNLESS OTHERWISE SPECIFIED:
   a. ALL RESISTOR VALUES ARE IN OHMS AND ARE 0·25W, 2%
   b. ALL DIODES ARE TYPE IN4148
   c. ALL TRANSISTORS ARE TYPE 2N4401.
2. HEAVY SOLID LINES INDICATE PRIMARY SIGNAL FLOW; HEAVY DASHED LINES INDICATE SECONDARY SIGNAL FLOW.
3. ENCIRCLED LETTER INDICATES QUICK DISCONNECT TERMINAL;
   ▽ INDICATES SIGNAL GROUND;
   ▽ INDICATES POWER GROUND.
4. [AA] LETTERS IN BOX INDICATE POINTS SIMILARLY IDENTIFIED ON MOTHER BOARD

Fig. 5 *Sweep amplifier, circuit diagram (Part of A1).* *Fig. 5*

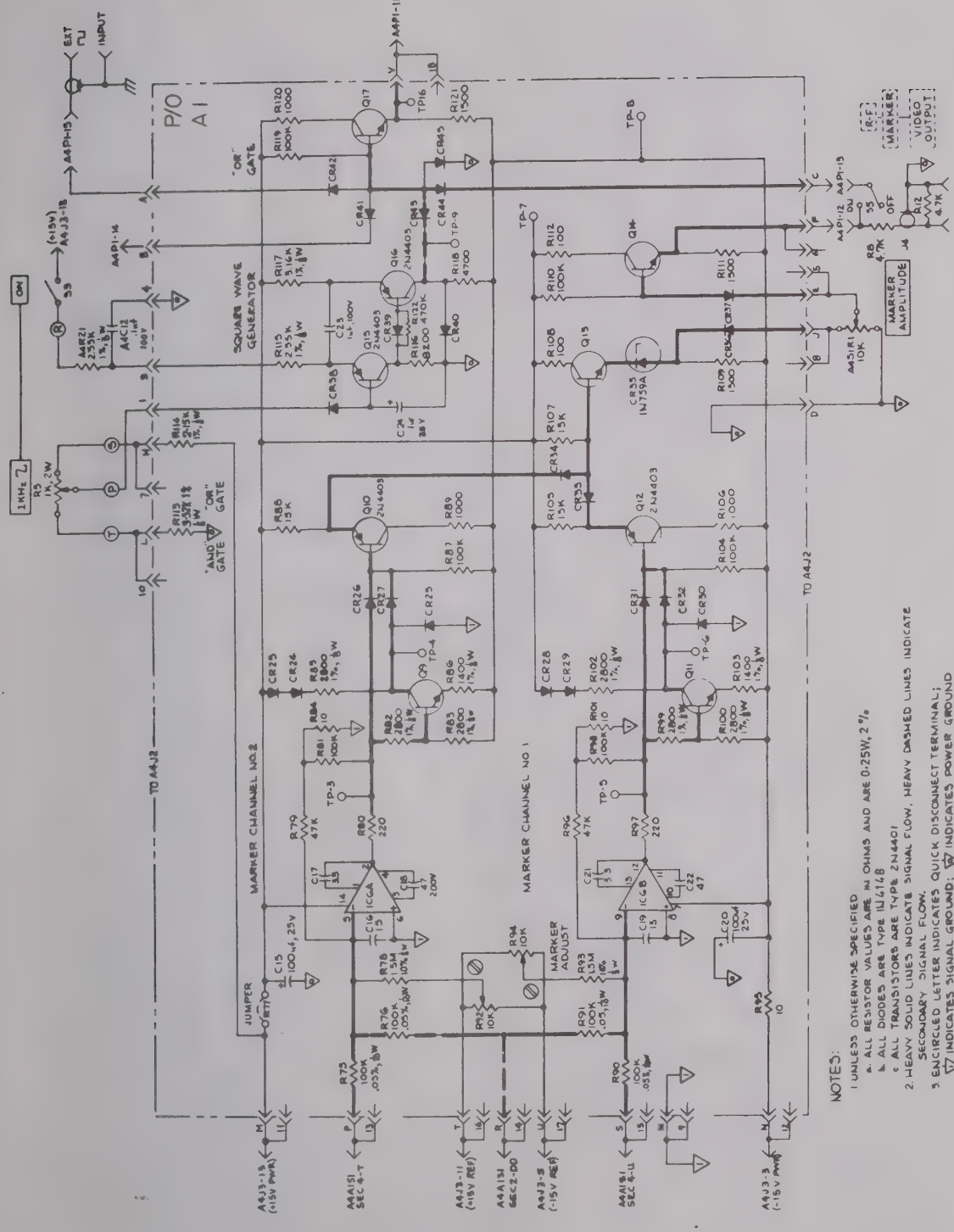

P/O A1
SQUARE WAVE GENERATOR
"OR" GATE
"AND" GATE
MARKER CHANNEL NO.2
MARKER CHANNEL NO 1
MARKER ADJUST
MARKER AMPLITUDE
TO A4J2
NOTES:
1 UNLESS OTHERWISE SPECIFIED
a. ALL RESISTOR VALUES ARE IN OHMS AND ARE 0.25W, 2%
b. ALL DIODES ARE TYPE 1N4148
c. ALL TRANSISTORS ARE TYPE 2N4401
2 HEAVY SOLID LINES INDICATE SIGNAL FLOW. HEAVY DASHED LINES INDICATE SECONDARY SIGNAL FLOW.
3 ENCIRCLED LETTER INDICATES QUICK DISCONNECT TERMINAL;
▽ INDICATES SIGNAL GROUND; ▽ INDICATES POWER GROUND
4 ALL CAPACITOR VALUES ARE IN MICROFARADS AT 200 VWDC, 10%.

Fig. 6 Marker and square generator, circuit diagram (Part of A1)

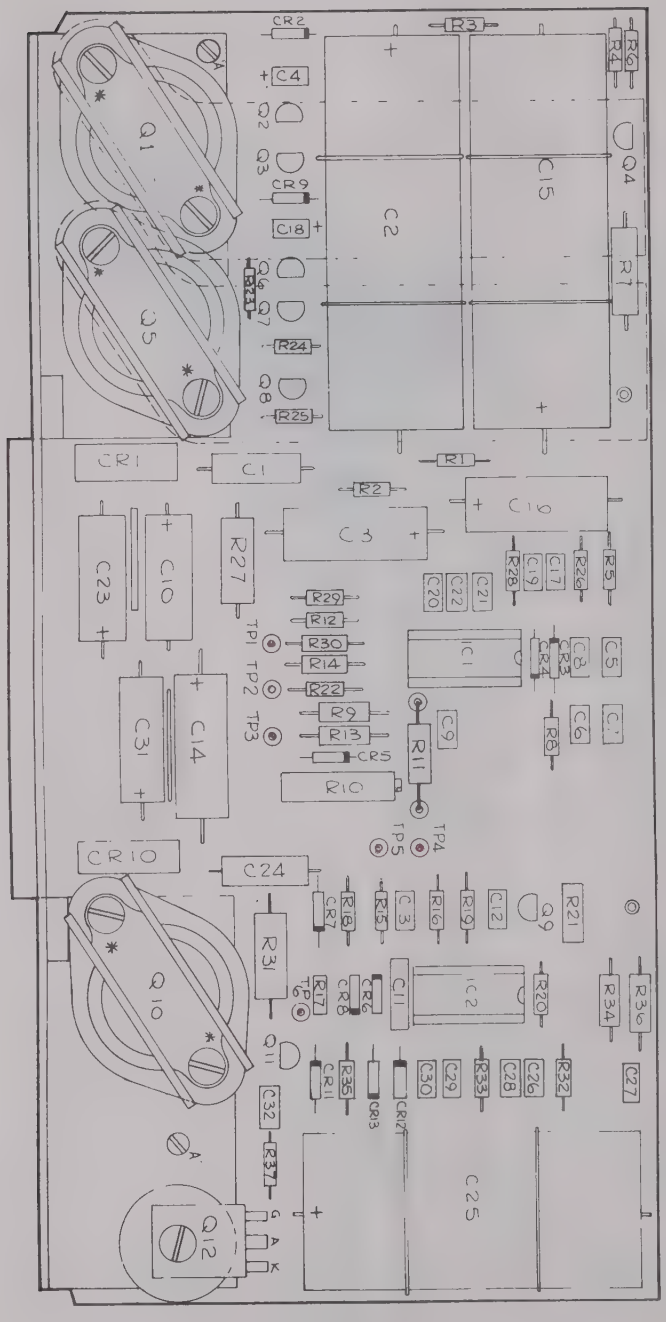


Fig. 7 Assembly A2 : Power supply component identification

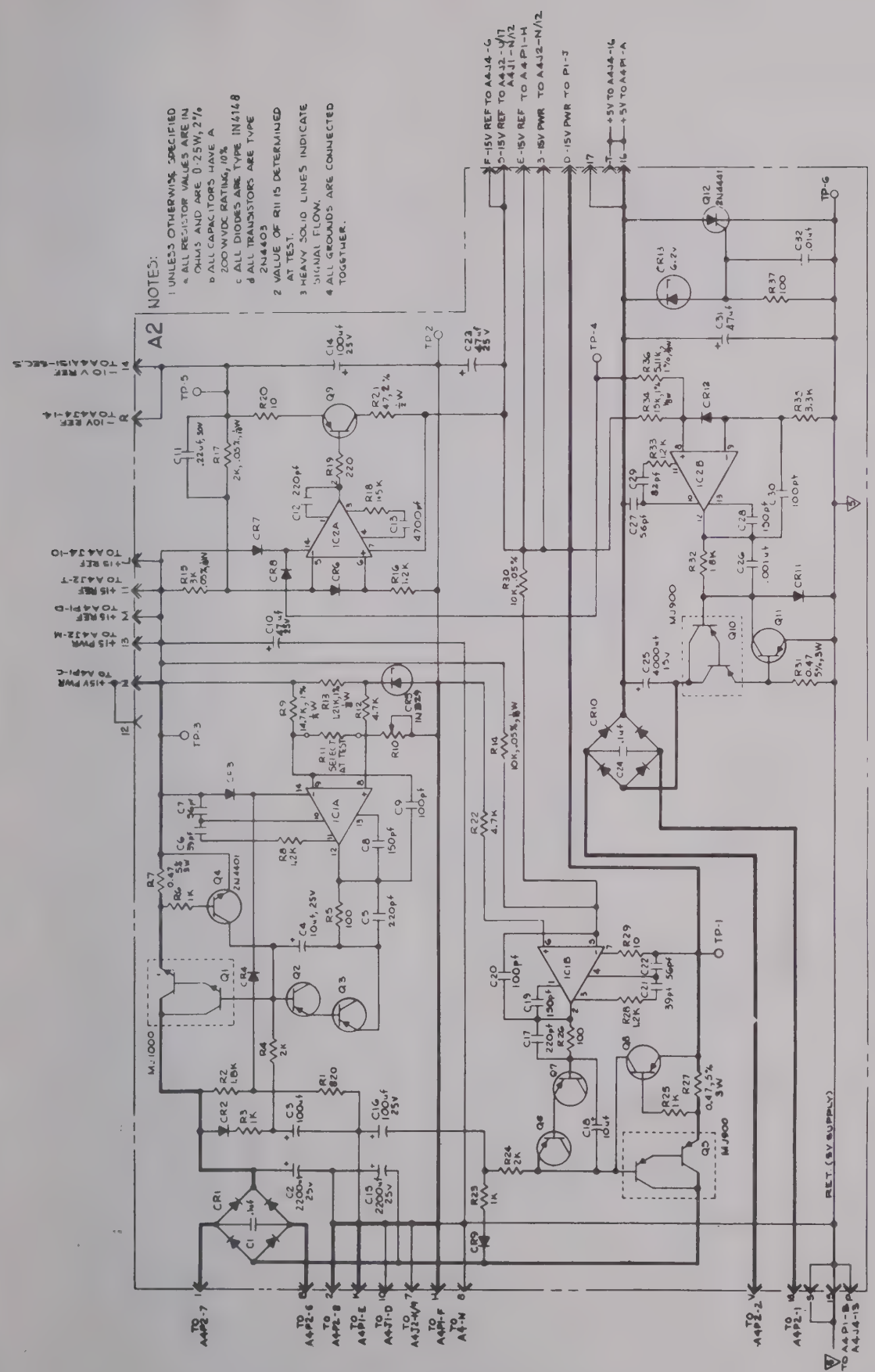


Fig. 8 Assembly A2 : Power supply circuit diagram

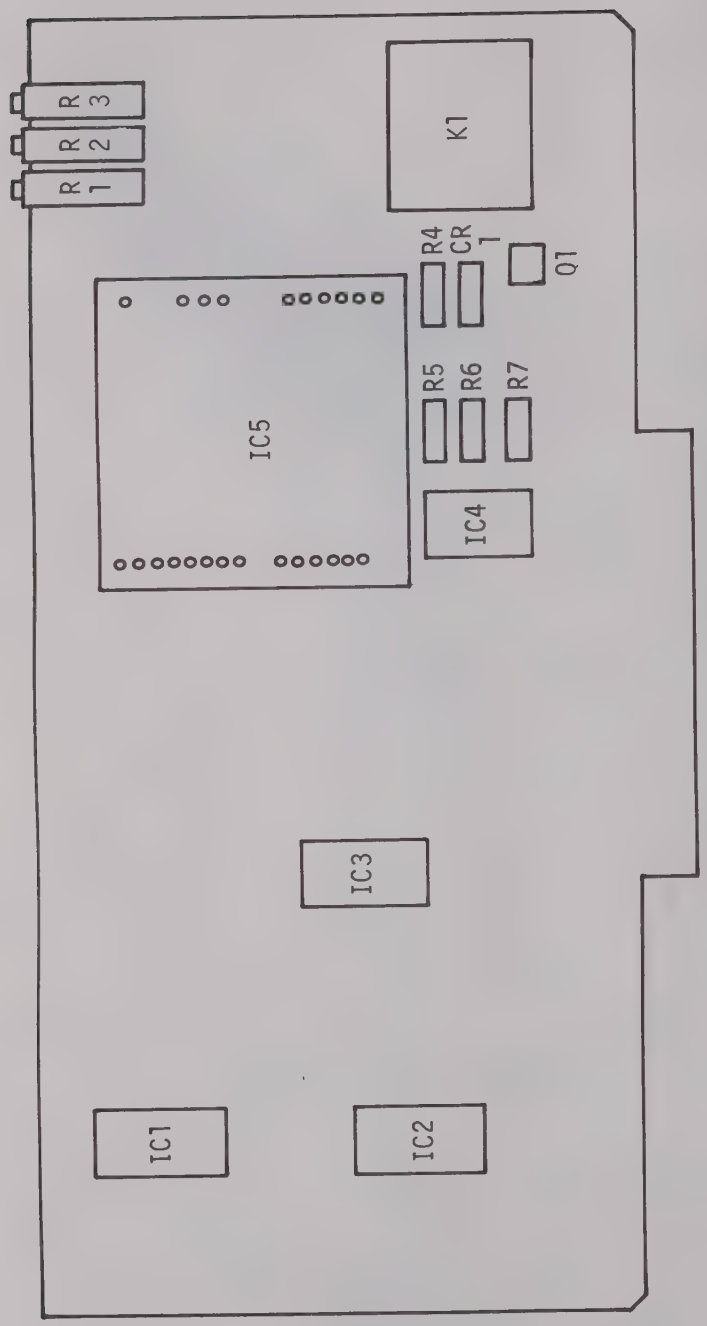


Fig. 9 Assembly A3 : Remote programming, component identification

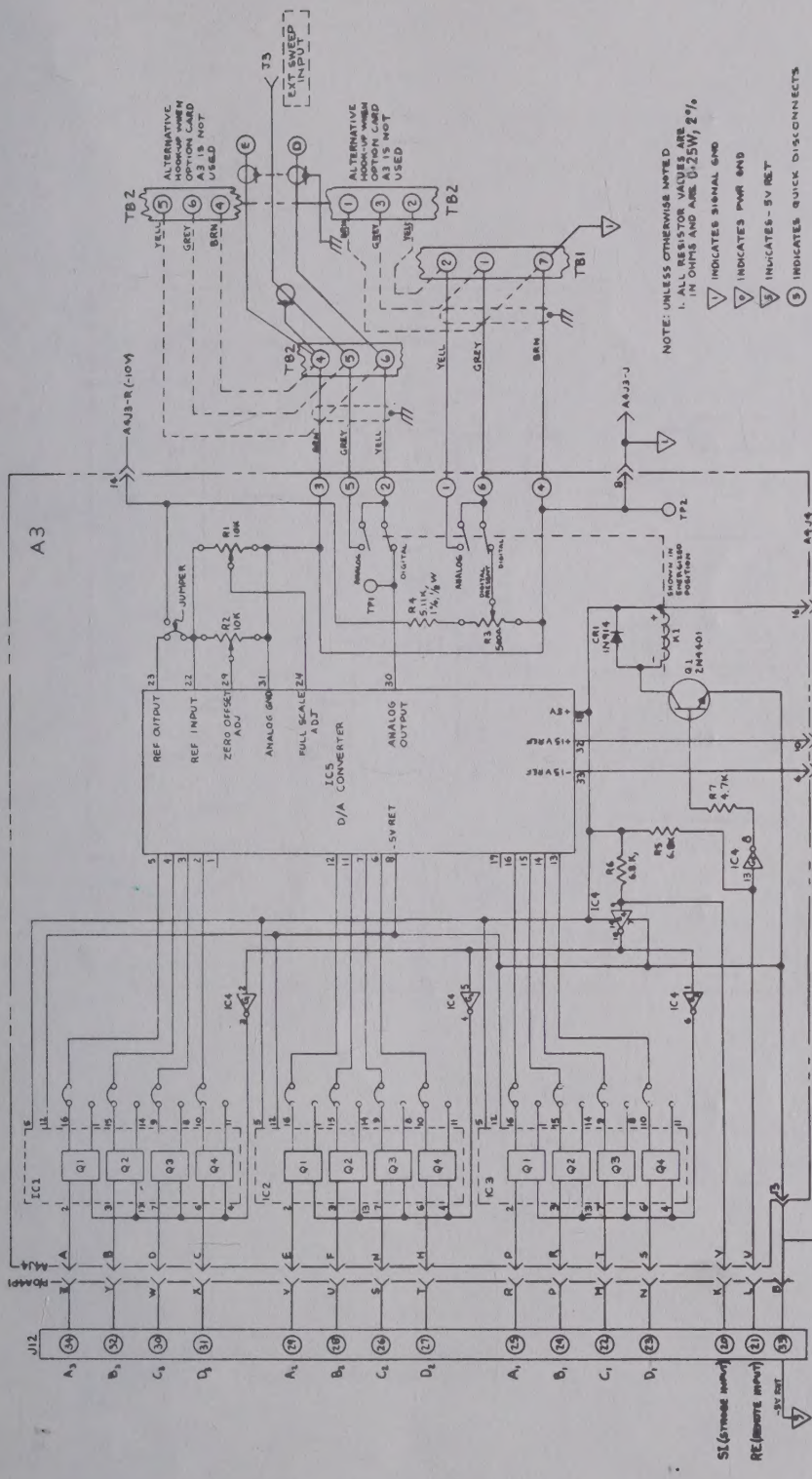


Fig. 10 Assembly A3 : Remote programming, circuit diagram

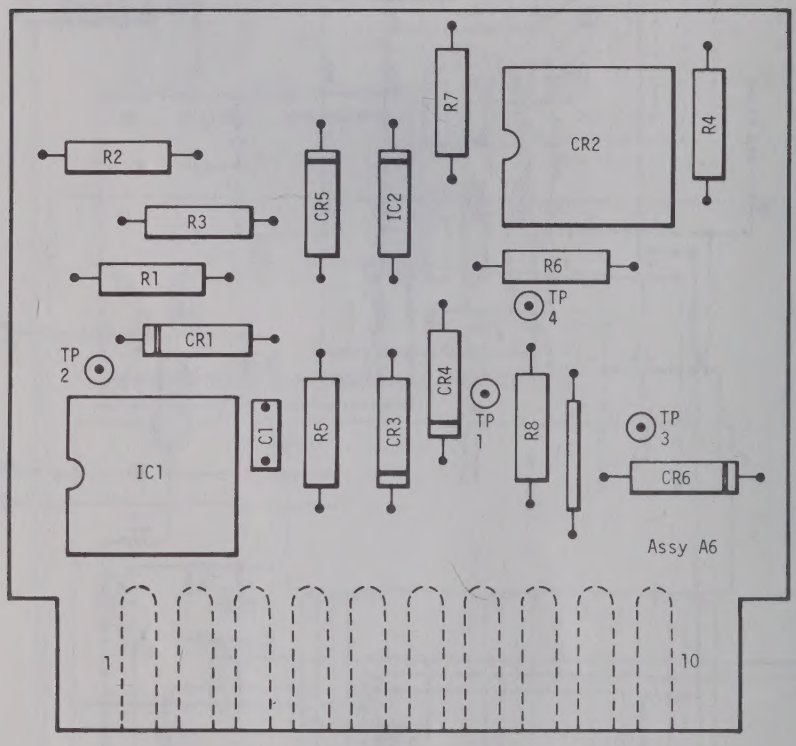


Fig. 11 Assembly A6 : Dwell time and Z-blanking processor, component layout

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